GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION
ONE CONSERVATION WAY · BRUNSWICK, GA 31520 · 912-264-7218

WALTER RABON
COMMISSIONER

DOUG HAYMANS
DIRECTOR

Finfish Advisory Panel

February 28, 2024 – 6:00PM-8:30PM
(Shipman Building, CRH Brunswick)

6:00 Welcome & Introduction of Guest Speakers

6:05 Approve Agenda

6:10 Gray's Reef National Marine Sanctuary: Kim Roberson (GRNMS Research Coordinator and Unit Diving Supervisor)

6:30 Economic Impact of Saltwater Recreational Fishing in Georgia: Dr. Eugene Frimpong (Coastal Economic Specialist, UGA Marine Extension & GA Sea Grant)

7:00 CRD Habitat Enhancement and Restoration Unit Update

7:15 ASMFC Red Drum Benchmark Stock Assessment Update

7:25 CRD Marine Sportfish Population Health Survey: 2023 Netting Data

7:45 Review Survey Results from "Georgia Saltwater Anglers' and Captains' Attitudes Toward Saltwater Fishing Issues" relative to Flounder

8:30 Adjourn

To join the meeting virtually through Zoom, use the web address below.
The meeting will begin at 6PM, so please log on by 5:45 to confirm connectivity.
https://us02web.zoom.us/j/85291132464?pwd=d1Ezdmo4N2l0b2dtand1MVNEOXNiZz09
Meeting ID: 852 9113 2464
Passcode: 542855

Gray's Reef National Marine Sanctuary

Annual Accomplishments

Fiscal Year 2023

U.S. Department of Commerce
Gina Raimondo, Secretary

National Oceanic and Atmospheric Administration
Richard W. Spinrad, Ph.D., Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

National Ocean Service
Nicole LeBoeuf, Assistant Administrator

Office of National Marine Sanctuaries
John Armor, Director

Created February 2024

Gray's Reef National Marine Sanctuary
10 Ocean Science Circle
Savannah, Georgia 31411

Cover photo: Scuba divers from the Georgia Aquarium and Gray's Reef National Marine Sanctuary ascend from a research dive off the Georgia coast. Brandon Schleiger/NOAA

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From the Superintendent

Dear Partners and Friends,

On behalf of our incredible team at Gray's Reef National Marine Sanctuary, I am delighted to share what we have achieved throughout Fiscal Year (FY) 2023 towards meeting our management plan goals and objectives. FY2023 was a pivotal year for the sanctuary being the first full-year of post-COVID 19 operations and a transition to a new management paradigm. The acquisition of our incredibly capable research vessel (R/V *Gannet*), and opening of the Gray's Reef Ocean Discovery Center in Historic Downtown Savannah, GA have forever changed how the sanctuary engages with the community and carries out scientific research and monitoring activities. Once again, we were able to engage (in-person) with local communities, visitors to Savannah and sanctuary waters, and deliver impactful education and outreach programs and events.

In our new paradigm, we made great strides improving recognition and reach of our management organization including resource protection, scientific research and monitoring, education and outreach, and vessel and dive operation functions. We are striving to be a convener and leader in ocean conservation and management across the South Atlantic Bight from Cape Hatteras, NC to Cape Canaveral, FL and out to the Blake Plateau while conserving and protecting our important sanctuary resources. Engaging stakeholders across the region is critical to conserving and protecting resources within our national marine sanctuary and across the range of live-bottom habitats and highly-migratory species of fish, sea turtles, and marine mammals including the critically-endangered North Atlantic right whale.

Through collaborative efforts with scientists, local communities, and dedicated stakeholders, we've made significant strides to

(1) maintain or improve the condition of all sanctuary resources,
(2) increase the awareness of, and support for the sanctuary, and
(3) advance collaborative and coordinated management to achieve objectives in our management plan.

This document highlights a few of our key accomplishments towards meeting these objectives and underscores our unwavering dedication to conserving and protecting Gray's Reef National Marine Sanctuary, connected habitats, and cultural values across the South Atlantic Bight.

We are grateful for the continued support from our dedicated partners, stakeholders, and our growing connection with the community we serve.

Stan Rogers, Superintendent

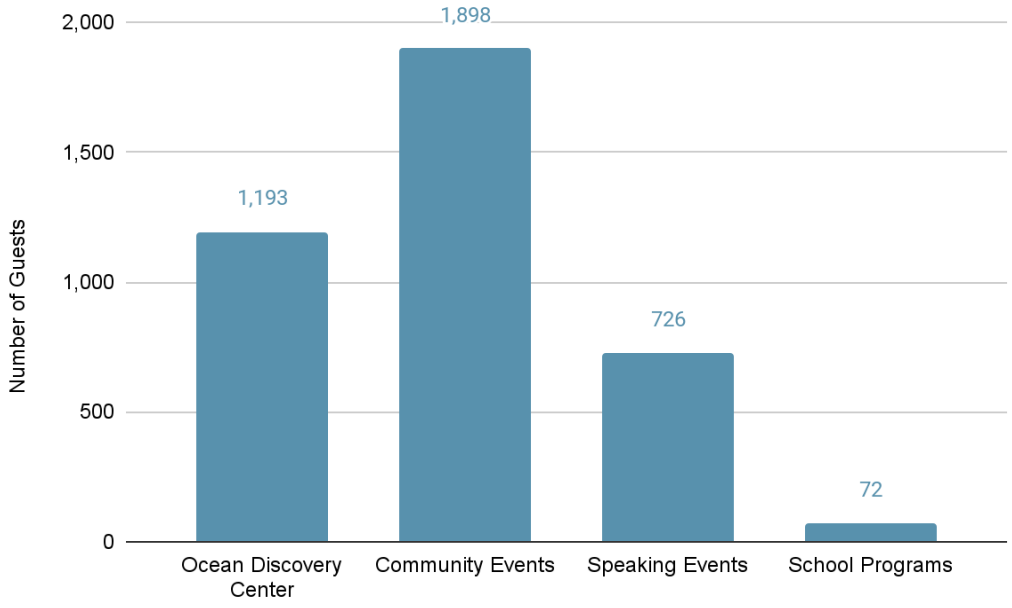
NOAA Gray's Reef National Marine Sanctuary

Education and Outreach

The education and outreach program of Gray's Reef National Marine Sanctuary brings the wonders of the sanctuary's habitats into the communities that steward them. Our mission dictated by the sanctuary's management plan is *to enhance public awareness, understanding, sustainable use, and appreciation of the sanctuary, while connecting people to the unique resources of Gray's Reef National Marine Sanctuary*.

By fostering a deeper understanding of marine ecosystems, biodiversity, and conservation principles, such programs empower communities across the southeast U.S. to actively engage in the protection and preservation of these ocean habitats. The Gray's Reef Ocean Discovery Center in downtown Savannah, Georgia cultivates a sense of responsibility and environmental stewardship among the public through education programs. Outside partners, exhibits, public events, social media and a volunteer corps further bridges the gap between scientific research and the broader community, ensuring that the sanctuary's goals and achievements are communicated effectively.

In 2023, education and outreach initiatives celebrated the first year of the Ocean Discovery Center, continued long-standing teacher workshops "Rivers to Reefs", unveiled a new sanctuary website, established exhibits in local libraries, and attended ocean-focused public events. Throughout the year, over 3,800 guests learned about the sanctuary through Center visits, public events with virtual dives, invited speaking events, and K-12 school programs.



First full year of the Gray's Reef Ocean Discovery Center

Mary Quinn, Education and Outreach Coordinator leads a small group through the Ocean Discovery Center. Photo: NOAA

A year has passed since the dedication of the Gray's Reef Ocean Discovery Center, marking a milestone in our commitment to marine education and outreach. This moment gives us reason to celebrate the achievements of the past year and instills an even greater sense of anticipation for the future.

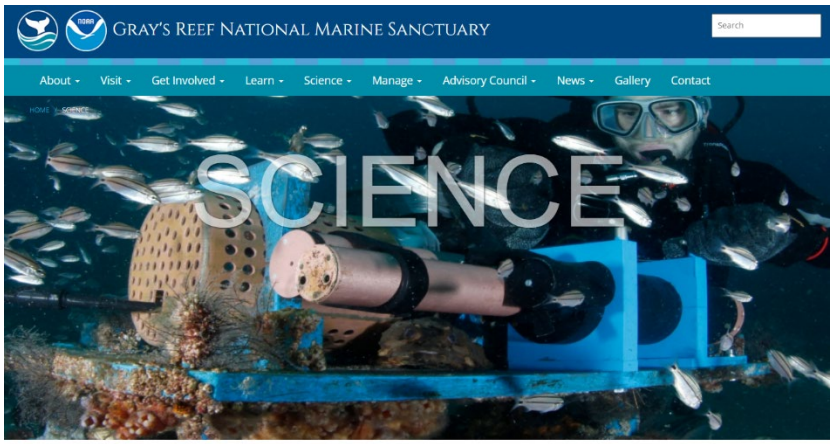
With the efforts of our center staff and volunteers, the Ocean Discovery Center now extends its welcome to the public every Thursday through Saturday from 10:00 am to 4:00 pm, providing a unique and engaging space that encourages learning and discovery. Admission to the center is free to ensure access for all members of our community. This inclusivity aligns with our broader mission to share the wonders of the marine world with as many people as possible, and foster a sense of connection and responsibility towards our oceans.

Throughout the year, the center has been a dynamic venue, hosting a variety of events that have enriched the experiences of our visitors. School groups have had the opportunity to delve into marine science through specially tailored programs, while summer camps have provided a platform for young minds to explore and appreciate the marine environment. The center has also been a gathering place for the sanctuary advisory council, facilitating discussions about the preservation and management of Gray's Reef National Marine Sanctuary. Additionally, our science symposiums have served as forums for the exchange of ideas and the promotion of scientific knowledge related to marine conservation.

Looking ahead, the Gray's Reef Ocean Discovery Center is poised to continue its vital role in marine education and outreach. In 2023 through our partnership with the National Marine Sanctuary Foundation, we invested $800,000 in new and immersive exhibits for the center. The exhibits will be designed and fabricated in 2024 and installed during the winter of 2024/2025. We are eagerly anticipating a grand re-opening of the Ocean Discovery Center with these new exhibits. As we reflect on the accomplishments of the past year, we remain committed to fostering a deeper understanding of our oceans, inspiring a sense of stewardship, and nurturing a community that actively participates in the protection of our precious marine ecosystems.

[Plan your center trip today]

New website design



The refreshed sanctuary website focuses on sanctuary visitation, scientific research, resource protection, and multimedia. Photo: NOAA

The year started with a new digital face for the sanctuary. Part of the system-wide website redesign, the Office of National Marine Sanctuaries web team launched a freshly redesigned website for Gray's Reef. The new design aids explorers, divers, anglers, researchers, educators, volunteers, students, and others in learning about research, history, happenings, and resources in the sanctuary.

The goal of the redesigned website is to provide concise content and an accessible platform to foster a sense of unity among individuals with varied interests. By catering to the needs of a broad group of stakeholders, the sanctuary aims to empower and inspire a collective effort towards the preservation and appreciation of Gray's Reef National Marine Sanctuary. As we navigate this digital landscape, the redesigned website stands as a testament to the sanctuary's commitment to transparency, accessibility, and the ongoing journey of sharing the wonders of the sanctuary with the virtual world.

[Explore the website on your own]

Georgia's first Ocean Guardian School developed in partnership with Georgia Aquarium

NOAA's Ocean Guardian Schools advocate for ocean conservation that benefit sanctuaries and the world's oceans. Photo: NOAA

NOAA Ocean Guardian Schools make a commitment to the protection and conservation of its local watersheds, the world's ocean, and special ocean areas, like national marine sanctuaries. The Office of National Marine Sanctuaries, Gray's Reef National Marine Sanctuary, and Georgia Aquarium entered into a partnership to establish Ocean Guardian Schools in the State of Georgia. In 2023, the sanctuary and Georgia Aquarium enrolled with the first two Georgia schools, Oglethorpe Charter in Savannah and McClesky Middle School in Atlanta. These two schools are the first in the state and committed to maintaining watersheds connected to Gray's Reef National Marine Sanctuary. Educators are the main drivers behind the success of the NOAA Ocean Guardian School program, often spearheading stewardship projects to ignite positive environmental change on campuses and in surrounding communities.

The NOAA Ocean Guardian Program extends beyond the classroom, incorporating various elements such as a youth ambassador program, kids club, dive club, and specialized classrooms. These initiatives serve to create a comprehensive network of environmental advocates who, through diverse channels, contribute to the overarching goal of preserving our oceans and promoting sustainable practices. In this way, the NOAA Ocean Guardian Program emerges as a holistic approach to environmental education, empowering young minds and fostering a collective sense of responsibility towards the well-being of our marine ecosystems. Gray's Reef National Marine Sanctuary and Georgia Aquarium will certify Oglethorpe Charter in Savannah and McClesky Middle School as official Ocean Guardian Schools in late summer 2024.

Learn more about Ocean Guardian Schools

Georgia Aquarium sponsors Rivers to Reefs teacher workshop

The Rivers to Reefs teacher workshop brings teachers on an adventure from the headwaters of the Altamaha River near Atlanta, Georgia to the coastal salt marshes. Photo: NOAA

In July, 16 science teachers from Title I schools across Georgia embarked on a week-long workshop connecting rivers of Georgia's Piedmont to ocean habitats hundreds of miles east. The Rivers to Reefs program was developed by Gray's Reef National Marine Sanctuary in 2010 immersing teachers in a free six-day, jam-packed teacher's workshop of fantastic field experiences and empowering classroom lessons. Through river canoeing, marsh treks, and ocean expeditions, the workshop begins in Atlanta with a visit to the Georgia Aquarium's Learning Loop. This year, the sixteen participants followed the course of the Altamaha Watershed from its headwaters near the Georgia Aquarium to Gray's Reef National Marine Sanctuary with numerous field experiences along the way. Once on the Georgia coast, the University of Georgia Marine Extension and Georgia Sea Grant hosted the teachers to coastal rivers and marsh tours. Gray's Reef National Marine Sanctuary couldn't show the teacher the reef in person, but provided a segment about ocean currents from Georgia's coastal rivers, ongoing research on microplastics, and sea turtle Arc StoryMaps hosted by the sanctuary. In 2024, the sanctuary will have the capability to host two Rivers to Reef Workshops aboard the R/V *Gannet*!

Additional teacher resources

Gray's Reef returns to community events

Georgia Department of Natural Resources hosts the annual CoastFest in Brunswick, Georgia. This is the first year since the COVID-19 pandemic that Gray's Reef National Marine Sanctuary attended the event giving away commemorative posters and letting guests explore the sanctuary through virtual dives. Photo: Ben Prueitt/NOAA

Throughout the year, sanctuary volunteers and staff reconnected with the community by participating in a variety of events, engaging with a diverse audience of over 1,800 individuals. These events provided unique opportunities for attendees to explore virtual dives, collect commemorative posters, and deepen their knowledge about the sanctuary's ecological significance. Gray's Reef National Marine Sanctuary attended the Savannah Boat Show, Georgia DNR's CoastFest in Brunswick, BugFest at the Savannah Children's Museum, Earth Day in Savannah, Skidaway Marine Science Day, and the Hope Summit in Charleston, South Carolina.

Attending these events represents a strategic partnership with community organizations that share a vested interest in environmental conservation. These collaborations play a pivotal role in fostering public awareness, appreciation, and the sustainable use of the sanctuary's resources. Through these booths and events, the sanctuary staff and volunteers effectively communicated the importance of preserving marine ecosystems and underscored the role that each individual can play in ensuring the long-term health of Gray's Reef National Marine Sanctuary. These types of outreach not only served as platforms for education but also as forums for building lasting connections with the community, cultivating a shared commitment to the stewardship of our oceans.

Volunteer at an upcoming event or the Ocean Discovery Center

Resource Protection and Management

Resource protection is at the heart of national marine sanctuaries and ocean conservation. Resources being the rocky foundation, ocean life, and waters located in (or moving through) the sanctuary all reserve protections under the National Marine Sanctuaries Act. Through the sanctuary management plan, resource protection goals include:

- *protect, maintain, restore, and enhance the natural habitats, populations, and ecological processes in the sanctuary;*
- *coordinate with federal, state, and local governments, international organizations, and other public and private interests to develop and implement plans to protect the marine environment and the sanctuary, and encourage the conservation of these resources;*
- *allow uses of the sanctuary not prohibited pursuant to other authorities, and consistent with resource protection.*

Over the last decade, sanctuary resources and environmental conditions have changed, creating new challenges and requirements for protecting resources and facilitating compatible use. At the same time, new tools for effective management have emerged, driven by scientific advances, technological innovation, and new partnerships. A re-evaluation of requirements and approaches, both current and future, will ensure that the sanctuary and its partners are making the most effective use of programmatic resources. Public engagement is central to NOAA's community-based approach to managing sanctuaries.

Assessing sanctuary health through the condition report

Scott Kathey, Resource Protection Coordinator, summarizes one of the conditions of the sanctuary in front of an expert panel. Photo: Ben Prueitt/NOAA

Knowing the current state of the sanctuary is a key factor as the management plan review process approaches. This assessment lays the foundation for informed decision-making and effective conservation strategies. In a collaborative effort involving sanctuary researchers, stakeholders, and educators, a comprehensive three-day workshop was conducted to compile data from numerous health markers. The workshop served as a hub of knowledge exchange,

bringing together the expertise of over 55 regional professionals representing government agencies, academia, businesses, and non-governmental organizations.

The workshop's primary objective was to gather insights into the sanctuary's overall health by evaluating a plethora of indicators. These health markers covered a broad spectrum of ecological, biological, and environmental parameters. Through presentations, participants delved into the intricate details of these markers, sharing their findings and observations eventually rating each with a status and trend rating. This inclusive approach facilitated a holistic understanding of the sanctuary's status, allowing for a multidimensional analysis that considered various perspectives and areas of expertise.

The diverse assembly of regional experts contributed to a rich discussion on the sanctuary's condition, offering valuable perspectives on its ecological trends and overall well-being. Their collective expertise, drawn from different sectors, not only ensured a comprehensive evaluation but also fostered a collaborative environment where participants could share knowledge, exchange ideas, and collectively draw conclusions. As the sanctuary prepares for the management plan review, the outcomes of this workshop stand as a robust foundation, providing essential insights that will inform decision-makers, guide conservation efforts, and shape the future direction of the sanctuary's management strategies. Gray's Reef National Marine Sanctuary anticipates finalizing and publishing the condition report in late 2024 or early 2025 ahead of scoping for management plan and regulatory review.

Read more about the condition report process

Sanctuary Advisory Council

The Gray's Reef Sanctuary Advisory Council is a community-based advisory group that provides advice and recommendations to the superintendent of the sanctuary on issues like management, science, community engagement, and stewardship. Advisory Council involvement plays a pivotal role in shaping the trajectory of Gray's Reef National Marine Sanctuary, fostering collaboration between stakeholders and contributing to the achievement of key milestones. The Council facilitated educational and outreach, scientific research and monitoring initiatives, and resource protection, underscoring its dedication to preserving the important marine environment of Gray's Reef.

One noteworthy Council initiative was the establishment of the 30X30 Working Group. This group played a crucial role in aligning the sanctuary's objectives with the Executive Order "Conserving and Restoring America the Beautiful" and the Administration's goal of conserving 30% of the US lands and oceans by 2030. By leveraging expertise and diverse perspectives, the Council offered suggestions of how Gray's Reef National Marine Sanctuary may contribute to this goal and principles of the executive order.

A significant development within the Advisory Council's structure is the appointment of a new chair, Russel Kent. Kent has served on the Council as Conservation seat since 2022. The new chair brings fresh perspectives and a wealth of experience in the coastal southeast to guide the council in its efforts. This transition not only reflects the dedication of individuals to the

sanctuary's mission but also signifies a commitment to adaptability and innovation in addressing evolving challenges.

Furthermore, the Council actively engaged with the United States Coast Guard (USCG) Auxiliary Air Overflights to enhance the monitoring and protection of Gray's Reef National Marine Sanctuary. By collaborating with the USCG Auxiliary, the council ensures greater coverage and understanding about the use of sanctuary resources by boaters, fishers, and divers. This collaboration highlights the importance of interagency cooperation in safeguarding marine sanctuaries. Through these initiatives, the Sanctuary Advisory Council continues to be a driving force in guiding Gray's Reef National Marine Sanctuary toward a sustainable and resilient future.

Contact your SAC representatives with your ideas

New sanctuary staff

Mary Quinn, Katie Sandefur, George Poole, and Kathy Liu joined the Gray's Reef National Marine Sanctuary staff in 2023. Photos: Ben Prueitt/NOAA

2023 brought three new affiliate staff to support the sanctuary's mission. Mary Quinn assumed the role of Education and Outreach Specialist, bringing a wealth of experience and enthusiasm. In this capacity, Mary oversees the day-to-day operations of the Ocean Discovery Center, developing and implementing education and interpretive programs and coordinating a dedicated team of volunteers. Mary is poised to enhance sanctuary educational initiatives ensuring that visitors, students, and the community have access to engaging and informative programs that promote an appreciation of marine ecosystems.

Further supporting the Ocean Discovery Center is Katie Sandefur, Education Assistant at Gray's Reef National Marine Sanctuary. With a background in educational program development, Katie is well-equipped to contribute to the growth and enrichment of the sanctuary's educational offerings and interpretation. Her role involves implementing daily educational programs and providing interpretation of key themes and sanctuary resources to foster an environment of curiosity and learning for all those who engage with the Ocean Discovery Center.

Another critical addition to the sanctuary's team is Captain George Poole. Contracted through Cardinal Point Captains, Captain Poole brings significant maritime expertise as the Captain of the R/V *Gannet* and the R/V *Sam Gray*. Captain Poole's role is instrumental in facilitating research and monitoring, and educational expeditions, ensuring the safe and effective operation of sanctuary vessels and dive missions, and contributing to the overall success of the sanctuary's offshore mission.

Lastly, Kathy Liu, serves as the 2023-2024 Georgia Sea Grant Fellow–the fifth year Gray's Reef National Marine Sanctuary has hosted a fellow in partnership with the Georgia Sea Grant Program. This position supports the sanctuary research, resource protection, and education and outreach initiatives while providing an immersive and challenging learning environment for the fellow. These new staff elevate Gray's Reef National Marine Sanctuary mission towards marine conservation, education, and community engagement.

Meet our staff

Mapping and characterization of benthic habitats

The sanctuary's ocean mapping effort plays a crucial role in understanding and managing the diverse marine ecosystems across the South Atlantic Bight. Gray's Reef National Marine sanctuary is located on the continental shelf of the Bight that extends from Cape Hatteras, North Carolina, to Cape Canaveral, Florida. It's important for sanctuary managers and researchers to know the locations of similar bottom habitats and the ecological connectivity between this extensive area as well as the overall health.

In 2023, Gray's Reef National Marine Sanctuary mapped 31 square miles outside of the sanctuary. The importance of mapping and characterizing seafloor habitats in the region lies in the valuable insights it provides for ecosystem management and ecological connectivity and contributes to the U.S. goal of mapping the United State's Exclusive Economic Zone. Underwater mapping technologies create detailed maps that highlight the distribution and composition of the seafloor, and provide ocean scientists with a snapshot of where new studies

may be advantageous. This information is essential for understanding significance of different areas, identifying critical habitats for vulnerable species, and assessing the role of ocean currents and tides on the seascape. Effective management strategies can then be developed to mitigate potential threats and preserve the biodiversity and productivity of the South Atlantic Bight. Gray's Reef National Marine Sanctuary further leverages mapping data to generate habitat classification maps

Future activities will continue to make progress towards the NOMEC strategy (National Strategy For Mapping, Exploring, And Characterizing The United States Exclusive Economic Zone) to map and explore the entirety of the U.S. Exclusive Economic Zone (200 miles from all coasts). Technological advancements have allowed researchers to collect high-resolution data to later be processed into viable bottom maps. This progress not only contributes to scientific knowledge but also supports sustainable resource management practices, ensuring the long-term health and resilience of the marine environments within the South Atlantic Bight.

Discover technologies used at Gray's Reef National Marine Sanctuary

Scientific Research and Monitoring

The scientific research and monitoring program aims to enhance the understanding of the sanctuary's complex ecological processes and dynamics. By employing comprehensive scientific methodologies, including data collection, characterization, and continuous monitoring, the program seeks to provide valuable insights into the sanctuary's environmental conditions. With these initiatives, the sanctuary's research and monitoring aligns with the management plan goal to *support, promote, and coordinate scientific research, characterization, and long-term monitoring to enhance the understanding of the sanctuary environment and processes and improve management decision-making for optimal sanctuary resource protection.*

First annual science symposium

The legacy of scientific research at Gray's Reef National Marine Sanctuary stretches back over 40 years. In October, we convened scores of researchers for a two-day symposium addressing the ongoing research and future priorities of the sanctuary. This exchange, discussion, and sharing is a vital part to the scientific process and strengthens the effectiveness of studies conducted in and around the sanctuary.

The inaugural symposium convened researchers and students who studied Gray's Reef National Marine Sanctuary as early as 2003, exemplifying the long-term monitoring happening in the sanctuary. Presented research included ocean acidification, predator-prey relationships in fishes, ocean currents, artificial reefs, ocean gliders, microplastics, North Atlantic right whale monitoring, and ocean sound topics.

The symposium not only served as a platform for sharing current research but also as a nexus for cultivating interdisciplinary collaborations. By bringing together experts with various specialties, the event catalyzed cross-pollination of ideas and methodologies. This dynamic exchange not only fortified ongoing investigations but also sparked innovative approaches to

tackle emerging challenges facing Gray's Reef National Marine Sanctuary. As the legacy of research continues to evolve, the symposium stands as a time to synthesize our current understanding, and plan for future conservation of sanctuary's marine ecosystems for the benefit of present and future generations.

Discover the sanctuary's research

NOAA Ship Nancy Foster expedition–2023

The NOAA Ship Nancy Foster science party composed of researchers and divers from seven different organizations. Photo: Allan Quintana/NOAA

Each summer, Gray's Reef National Marine Sanctuary invites researchers aboard the NOAA Ship Nancy Foster for a multi-day research expedition in the South Atlantic Bight. This year's expedition focused on exploring live-bottom habitats outside of the sanctuary's boundaries. Partners from the Georgia Aquarium dive team, University System of Georgia, and NOAA explored 34 areas collecting video transect, species surveys, and ledge shape measurements.

Central to the mission was the commitment to contribute to the long-term goal of mapping 100 percent of the U.S. Exclusive Economic Zone. This strategy gained momentum as the NOAA Ship Nancy Foster mapped over 31 square miles of the Atlantic Ocean and eastern continental shelf. The mapping effort advances the understanding of the marine habitats within the South Atlantic Bight. By extending the scope beyond the sanctuary's boundaries, the researchers aimed to provide a more holistic perspective on the ecological connectivity in the region, contributing valuable insights to the broader scientific community.

The partnership between various agencies during this expedition exemplifies the importance of collaboration in advancing marine science across the southeast US. The inclusion of expertise from the Georgia Aquarium dive team, the University System of Georgia, and NOAA ensured a multidisciplinary approach, enriching the quality of the studies. The synergy between these organizations not only facilitated the execution of various research tasks but also laid the groundwork for future collaborative initiatives.

Explore our past Research Expeditions

Vessel and Dive Operations

Vessel operations and scuba diving provide Gray's Reef National Marine Sanctuary the ability to maintain equipment, study seafloor habitats, and manage and protect sanctuary resources. The sanctuary's fleet now consists of the 52' research vessel (R/V) *Gannet*, and the 36' R/V *Sam Gray* conducting scientific research and resource protection missions in the sanctuary. These operations support all aspects of the sanctuary's management plan, in particular to dedicate appropriate infrastructure and resources to support all programs, including the creation of models and incentives for conservation of sanctuary resources, and the development of innovative management techniques.

R/V Gannet (R5202) acquisition

The R/V *Gannet* brings versatility and range to scientific research, education, and resource protection in the South Atlantic Bight and coastal southeast US. Photo: Ben Prueitt/NOAA

The research vessel (R/V) *Gannet* is a 52-foot NOAA class III boat that brings a new era of ocean research, monitoring, education, and discovery to the southeast U.S. On Saturday, Feb. 10, 2024, the sanctuary dedicated the research vessel *Gannet* with support from NOAA Office of National Marine Sanctuaries, National Marine Sanctuary Foundation, and Skidaway Institute of Oceanography.

The aluminum hull boat designed to serve the mission of Gray's Reef National Marine Sanctuary and partners. The vessel is designed to deploy ocean monitoring instruments like underwater robots, ocean gliders, and seafloor sensors. It can also support science diving operations and the exploration of new seafloor habitats on the continental shelf. The *Gannet* can accommodate 15 passengers for scientific research, educator workshops or student day-trips.

The R/V *Gannet* comes at a critical time for NOAA and the Gray's Reef NMS team as significant investments are being made by NOAA and partners to map and characterize the Blake Plateau and deep sea corals, as well as increasing understanding of live-bottom habitats along the continental shelf. As with all sanctuary small boats, the R/V *Gannet* will contribute to our local blue economy through operations and maintenance, greater research and monitoring activities, as well as enhancing ocean literacy and education programs across the Southeast U.S.

[Learn about the sanctuary's vessel fleet]

Decommissioning the R/V Joe Ferguson

The research vessel *Joe Ferguson* (right) was first dedicated in 2002 to honor the tragic loss of the Sustainable Seas Expedition on September 11th, 2001. The original *Joe Ferguson* boat was decommissioned and a new *Joe Ferguson* boat (left) began her service to Gray's Reef National Marine Sanctuary in 2006. Photos: NOAA

The R/V *Gannet* replaces the R/V *Joe Ferguson* which was taken out of service in October 2023 after 17 years of service to the sanctuary. The *Joe Ferguson* operated regularly throughout her tenure providing for a versatile platform for scuba divers, underwater robots, uncrewed airplanes, among other missions.

The vessel was named after the late Joe Ferguson. Ferguson was the director of the National Geographic Society Education and Outreach Program. Ferguson and Ann Judge were accompanying three teacher-student pairs as part of the Sustainable Seas Expeditions from Washington, D.C. to Los Angeles, CA. The flight they were on—American Airlines Flight 77—was hijacked and flown into the Pentagon on September 11, 2001. Ferguson was 39. The education expedition was on their way to Channel Islands National Marine Sanctuary near Santa Barbara, CA. The Sustainable Sea Expedition explored Gray's Reef National Marine Sanctuary for two weeks in 1999. All students on the expeditions were sixth-grade students, 11 years of age.

Sanctuary amasses over 55 hours of dive time

Scuba divers completed 175 dives throughout the year, cumulatively collecting over 55 hours of dive time. Missions of these dives included equipment maintenance on the sanctuary hydrophone and receiver arrays, exploration of live-bottom habitats on the continental shelf and regular training. The sanctuary relies on volunteer divers, and reciprocity divers from the University System of Georgia. A new diving partnership came about this year with The Georgia Aquarium providing aquarium tank divers during the NOAA Ship Nancy Foster expedition. These volunteer and reciprocity divers accounted for 63% of all dives throughout the year.

As the sanctuary continues to rely on the dedication and expertise of its volunteer and reciprocity divers, these efforts highlight the significance of fostering a shared commitment to marine conservation. The synergy among these divers not only enhances the operational efficiency of the sanctuary's initiatives but also cultivates a deeper sense of stewardship and responsibility toward the marine environment. Looking ahead, the success of these endeavors serves as a testament to the power of community engagement in conserving the ecosystems of Gray's Reef National Marine Sanctuary.

America's Underwater Treasures

Economic Impacts of For-Hire and Recreational Fishing in Georgia

Eugene Frimpong
(Coastal Economic Specialist)

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA
Sea Grant

Project purpose and objectives

To understand the current economic performance of fisheries, assess the cumulative impacts of management actions and regulations on recreational anglers and fishing-related business over time, and inform the development and updates of state and federal fishery management plans

- Objectives:
  - ➢Collect economic and social data from for-hire fishing businesses and recreational anglers
  - ➢Estimate average net operating revenues of for-hire fishing businesses
  - ➢Estimate economic impacts of for-hire businesses and recreational fishing

Key findings – For-hire fishing business

$133,600

Annual Sales Revenue

- Mean estimate
- Depend on whether operator owns or rents a boat

$103,500

Annual Operating Cost

- Mean estimate
- Depend on whether operator owns or rents a boat

$30,000

Annual Net Revenue

- Mean estimate
- Depend on whether operator owns or rents a boat

667

Jobs Supported

$15.4 Million

Labor Income

$28 Million

Value-Added (GDP)

$53.3 Million

Total Output

Key findings – Recreational fishing

Anglers take 5 fishing trips annually

- Mean estimate
- varies widely based on mode of fishing activity

Top 3 fishing destinations:

- **Glynn County**
- **Chatham County**
- **Camden County**

- Varies based on mode of fishing

Top 3 species

Top 3 reasons affecting choice of fishing site:

- **Weather**
- **Past successful fishing at site**
- **Water quality**

Key findings – Recreational fishing

$594 (was $266 in 2017)

Average per trip expenditure

- Varies by resident type and mode of fishing

Top 3 expenditure categories

- **Lodging**
- **Meals**
- **Auto fuel**

- Varies by resident type and mode of fishing

3,217 (was 2,788 in 2017)

Jobs Supported

$74.4 Million (was $76M in 2017)

Labor Income

$155.1 Million (was $144M in 2017)

Value-Added (GDP)

$310.6 Million (was $231M in 2017)

Total Output/Sales

Project Activities

Survey design

- Background, Expenditure, Income (for-hire fishing), Sociodemographic
- Survey Review, Institutional Review Board (IRB)
- Pre-testing

Data Collection

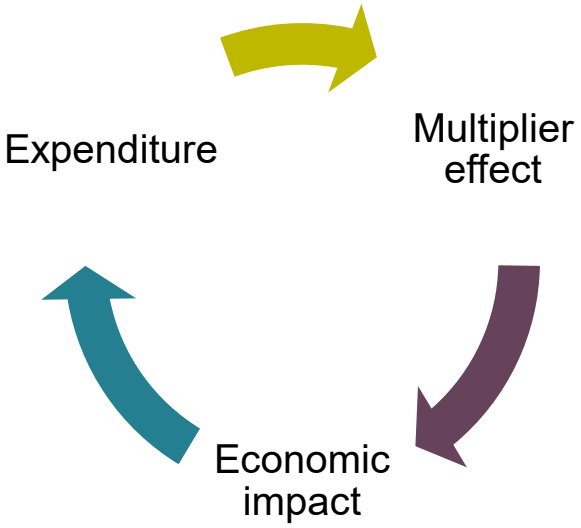
- Mail and Online
- Population and sample
- 2021-2022 and 2022-2023

Data Analysis

- Data cleaning
- Summary statistics
- Economic impact/contribution modelling

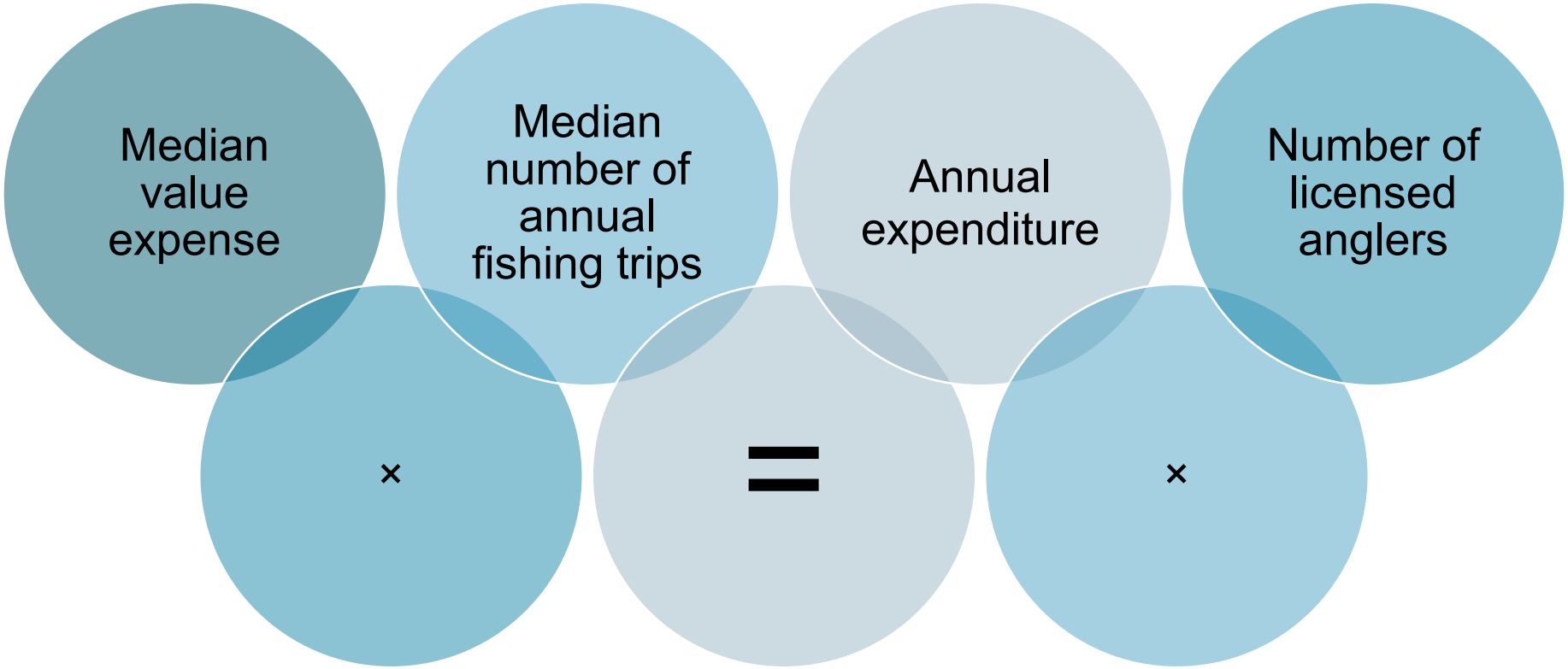
Economic Impact Modeling

- IMPLAN's Regional Input-Output Model
  - ➢ It estimates **gross output, labor income, employment**, **value-added (GDP)**



Direct effects	• Expenditure used in the input-output model
Indirect effects	• Inter-business transactions from initial sector purchases
Induced effects	• Outcomes due to increased household expenditures
Total effect	• Outcomes due to increased household expenditures

Estimating total annual expenditure



Example of IMPLAN's Input-Output Result

- Economic contributions of saltwater recreational fishing

Impact type	Employment	Labor Income ($ million)	Value Added ($ million)	Output ($million)
Direct effect	2,566	39.12	93.17	197.74
Indirect effect	348	20.77	34.41	66.92
Induced effect	302	14.47	27.48	45.91
Total effect	3,217	74.37	155.07	310.57

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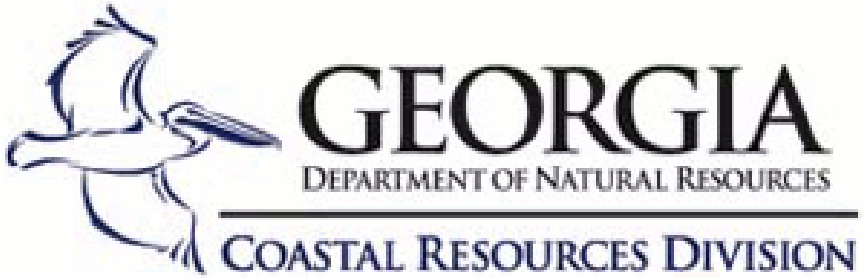
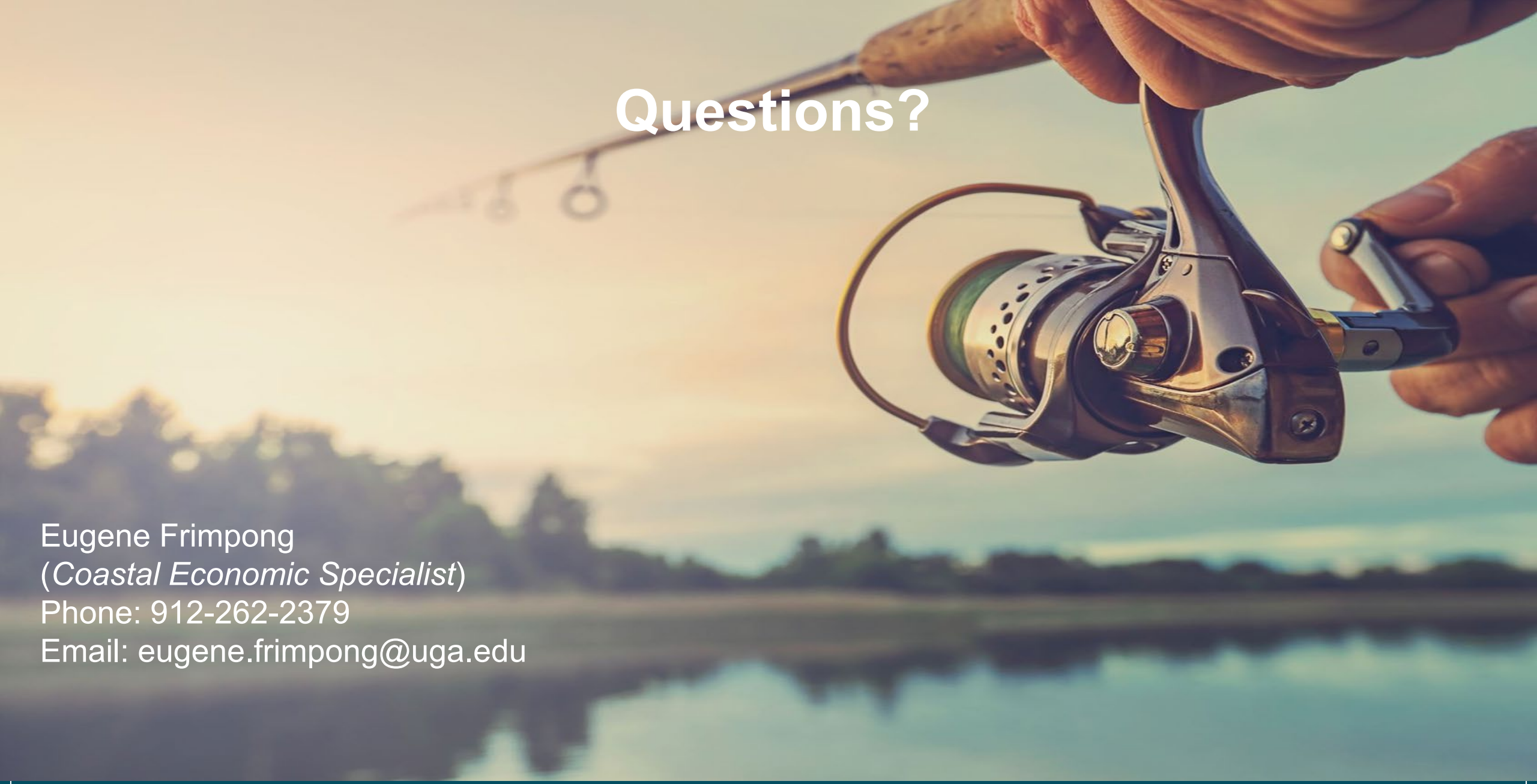
Imputed Multiplier	**1.3**	**1.9**	**1.7**	**1.6**

THANK YOU TO OUR SPONSORS



Questions?



Eugene Frimpong
(*Coastal Economic Specialist*)
Phone: 912-262-2379
Email: eugene.frimpong@uga.edu

ECONOMIC CONTRIBUTIONS OF

GEORGIA'S FOR-HIRE FISHING SECTOR

UGA Marine Extension and Georgia Sea Grant received funding from the Georgia Department of Natural Resources Coastal Resources Division to gather socioeconomic information on Georgia's recreational charter fishing sector and assess the economic contributions of the sector to Georgia's economy. A survey was disseminated to charter captains and businesses to collect sales and expenditure data.

Results of the survey show that roughly 184 licensed for-hire fishing captains in Georgia provided fishing guide services to nearly 53,000 anglers in 2021. Below are the total economic contribution estimates of the for-hire fishing sector in 2021 as well as the top 5 industries, by employment, that are indirectly supported by charter fishing.

667
JOBS
SUPPORTED

$28
MILLION
IN VALUE-ADDED

$53.3
MILLION
IN OUTPUT

TOP 5 INDUSTRIES (BY EMPLOYMENT)

SUPPORTED BY THE FOR-HIRE FISHING SECTOR

RETAIL: **MISCELLANEOUS STORES**

RETAIL: **SPORTING GOODS**

COMMERCIAL FISHING (BAIT)

SPORTING AND **ATHLETIC GOODS MANUFACTURING**

REPAIR AND **MAINTENANCE**

Financial assistance is provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office for Coastal Management, NOAA and passed through the Coastal Management Program of the Department of Natural Resources. Views expressed here, however, do not reflect those of the Office for Coastal Management, NOAA, and Georgia Department of Natural Resources.

GEORGIA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA

Sea Grant

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

For-Hire Recreational Fishing in Georgia: Characteristics and Economic Impact

Prepared for Georgia Department of Natural Resources, Coastal Resources Division

by

Eugene Frimpong

Marine Extension and Georgia Sea Grant, University of Georgia

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA
Sea Grant

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
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For-Hire Recreational Fishing in Georgia: Characteristics and Economic Impact

REPORT

2022

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A special thanks goes to all for-hire recreational fishing operators who participated in this study. The findings reported here would not have been possible without their voluntary willingness to participate in this study. The author thanks Bryan Fluech, Ben Posadas, Kevin Decker, and Matthew Gostein for reviewing the survey instrument, and Domena Agyeman and one anonymous reviewer for guidance and comments on this research.

Executive Summary

Mail and online surveys were designed to collect background and sociodemographic information on for-hire recreational (charter) fishing captains/operators, information on characteristics of charter fishing operations, vessel characteristics, trip-level expenditure and revenue, and information on operators' level of satisfaction with and concerns about the charter fishing sector, as well as their opinions on potential actions. Survey data on expenditure and revenue were combined with Impact Analysis for Planning (IMPLAN) data to estimate the economic impact of the charter fishing sector on the state's economy.

Data collection lasted for 6 months, January 2022 through June 2022, and a total of 60 (out of 198) licensed charter fishing operators responded to the survey. Majority (67%) of the responses were through mail survey. As expected, overall, most (93%) responding charter fishing operators were Georgia residents, and a plurality (38%) of them operated from Chatham County.

Survey results show that the average responding charter fishing operator is 50 years old and has 12 years of charter fishing experience. A plurality (16) of operators opined that they engage in charter fishing business so people can enjoy fishing. Most of the operators reported a decrease in revenue and profit, perhaps due to increased cost of operating charter fishing vessels, during COVID-19 pandemic. Most (77%) captains operate charter fishing business as sole proprietors. These operators (82%) own the charter fishing vessels, operate on part-time basis (64%), do not typically hire full-time crew, and provide additional fishing services such as fish cleaning and photography. On average, charter fishing captains operate fishing vessels that are 23 feet long, has a carrying capacity of 6 passengers, and has one outboard motor that has a horsepower of about 255. Furthermore, survey results suggest that the average operator generates about $125,705 (ranges from $6,000 to $1,1252,000) per annum sales revenue, receives about $7,891 (ranges from $0 to $60,300) per annum in tips, incurs about $102,333 (ranges from $7,432 to $590,261) annual operating cost, and generates about $30,000 annual net revenue.

Focusing on licensed resident charter fishing operators, economic impact metrics generated from IMPLAN's Input-Output model indicate that the charter fishing sector's 2021 gross output contribution to Georgia's economy is about $53.3 (between $36 and $70.5) million. This value includes approximately $24.7 (between $16.2 and $33.2) million in direct effect, $14.7 (between $11.8 and $17.7) million in indirect effect, and $13.6 (between $7.8 and $19.4) million in induced effect. The sector supports about 667 full time and part-time jobs. These estimates are slightly higher if licensed residents and non-resident charter fishing operators are combined. In terms of employment, the top five industries and services that directly rely on the charter fishing sector include the commercial fishing (bait) industry, retail sporting goods industry, repair and maintenance shops, retail miscellaneous stores, and sporting and athletic goods and manufacturing industries.

Generally, most (52%) responding charter fishing operators are satisfied with charter fishing business in Georgia. On the other hand, most (57%) are dissatisfied with Georgia's charter fishing regulations. Overall, majority of the concerns are related to fish limits.

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I. INTRODUCTION

For-hire recreational fishing, popularly known as "charter fishing", is increasingly becoming an important sector in US marine economy. Charter fishing operators offer anglers with boat access and fishing guide service for a fee, and thus provide anglers access to inshore and offshore marine resources, including highly migratory fisheries. Anglers' expenditures on fishing trips, in US, generates billions of dollars of economic impact (Lovell, Hilger and Rollins, 2020; American Sports Fishing Association, 2022). And as demand for charter fishing services increase, a range of social, economic, and ecological impacts are expected. That is, to effectively manage recreational fisheries it is critical to understand the impacts of the various recreational fishing sectors, particularly the economic impact of the charter fishing sector which has been understudied.

This study aims to provide current socioeconomic information on charter fishing in the state of Georgia, where the number of charter fishing operators has grown increasingly over the last decade, and recreational fishing is one of the largest user groups of marine resources in the state. About a decade ago, a study suggested Georgia had only about 23 licensed charter fishing operators, and their activities contributed about $1.6 million to the state economy (Holland *et al*., 2012). By estimates, in 2021, about 184 licensed charter fishing operators in Georgia provided fishing guide services to nearly 53,000 passengers. The state's charter fishing sector has unique attributes by the nature of services it provides and so requires periodic and timely information for local fisheries management decision making. This is especially true when weighing economic considerations against fisheries concerns.

Responding to the lack of economic information on Georgia's charter fishing sector, in 2020, Georgia Department of Natural Resources (GA DNR) awarded Marine Extension and Georgia Sea Grant, University of Georgia, a Coastal Incentive Grant to gather socioeconomic information on the state's recreational fishing industry and assess the economic impacts of the industry, including the charter fishing sector. To that end, four specific objectives were identified to help achieve this goal: (1) collect for-hire trip level economic data pertaining to last trip revenues, expenses, and operating characteristics, (2) estimate the average net operating revenues of for-hire fishing businesses from trip level economic data collected and subsequent sector level revenues generated, (3) create economic impact models for for-hire revenues and expenditures, and (4) publish findings and create educational outreach materials.

The rest of this report is as follows. The next section discusses survey design, target population and sample obtained, and data collection. This is followed by data analysis, results, conclusion, and reference sections. Other related information is provided in the appendix of this report.

II. DATA COLLECTION ACTIVITIES

Survey Design

To address study objectives, a mixed-mode mail and online surveys were designed in collaboration with charter operators and topic experts to make sure that survey questions resonate with charter operators. Inputs from these stakeholders were combined with information from prior related studies (Lichtkoppler 2002; Savolainen, Caffey, and Kazmierczak, 2012; Holland *et al*., 2012; Steinback and Brinson 2013) to inform the final design of the survey.

A total of 58 survey questions were produced and organized under seven broad sections: questions regarding (1) background and sociodemographic, (2) ownership, organization, and operating characteristics of charter fishing business, (3) primary vessel characteristics, (4) last trip expenses, (5) last trip revenue, (6) satisfaction with and concerns about the charter fishing sector in Georgia, and (7) potential actions/recommendations. A deliberate decision was made to include questions that elicit operator's opinion about the impact of COVID-19 pandemic on their businesses, participation in extension education, level of satisfaction with charter fishing business and regulations, concerns about the charter fishing sector, and opinions on potential actions. This idea was not part of the original proposal but deemed important for fisheries management decisions. The introduction section of the survey provided participants with information on who to contact if they had questions about the survey, why the study is being conducted, and a confidentiality statement. Participation was voluntary. An electronic link was included in the mail surveys if participants instead preferred to complete the survey online. The online survey was designed such that it was compatible with mobile electronic devices, including mobile phones, tablets, etc. A draft of the questionnaire is included in the appendix of this report.

Population and Sample

A list of 198 licensed saltwater guides/captains/operators with unique identification numbers was obtained from GA DNR under a cooperative agreement between GA DNR and the board or regents of the University System of Georgia. A total of 184 captains (out of the 198), were Georgia residents. Because the population is only 198, rather than needing a representative sample, a census survey was utilized.

Typically, two types of operators are identified: head boat operators and charter boat operators (Holland *et al*., 2012; Savolainen, Caffey, and Kazmierczak, 2012). By regulation, head boat operators operate vessels that carry more than six passengers while charter fishing operators operate vessels carrying six or fewer passengers per trip (Savolainen, Caffey, and Kazmierczak, 2012). The population frame received for this study, however, did not allow for decomposing licenses by vessel type. Discussions with some charter captains in Georgia, however, suggest that charter boat operations dominate in the state. This was confirmed in the survey responses and suggested in past study (Holland *et al*., 2012).

Data Collection

Data collection procedures followed the best practices suggested by Dillman, Smyth, and Christian (2014). First, pre-survey notification letters were sent to the 198 licensed for-hire recreational fishing operators. The letters described the survey, when operators should expect survey packets, how the responses will be used, and how findings could be used to inform recreational fisheries management. The survey was launched on January 7, 2022, about two weeks after pre-survey notice letters were mailed out. After the launch, reminder notices were sent to participants at different times: February 10 and 28, March 29, April 21, and May 18, 2022. To encourage participation and appropriate responses, the survey was anonymous, and had no unique identification numbers. There is, however, a trade-off. That is, in striving for anonymity, I was unable to determine who has completed and returned the survey. As such, reminder notices were sent to all for-hire charter fishing operators in the population frame.

Data collection lasted for 6 months (January through June 2022)[1] and a total of 60 operators responded to the survey. However, responses from 55 operators were usable data bringing the response rate to 28%. A total of 37 (67%) responding operators returned the survey via mail while 18 (33%) used the online option (Qualtrics). A total of 4 out of the 60 responding operators were nonresidents. However, two of the nonresident operators suggested the home port of their primary vessel is in Georgia. Table 1 presents the breakdown of number of respondents by state and county (home port of primary vessel). About 21 (38%) of responding operators indicated that the home port for their primary vessel is at Chatham County. Fourteen (26%) indicated that the home port of their primary vessel is at Glynn County, 8 (15%) said home port for their primary vessel is at Camden County, 5 (9%) operators said home port for their primary vessel is at Bryan County and 3 (6%) captains' primary vessel home port is at Macintosh County. Two operators indicated their primary vessel home port is Liberty and Brantley (Table 1). Furthermore, two non-resident responding charter fishing operators indicated their primary vessel port is Nassau County in Florida.

Table 1. Number of respondents by county

County	Number of respondents	Proportion
Georgia		
Chatham	21	38%
Glynn	14	26%
Camden	8	15%
Bryan	5	9%
Mcintosh	3	6%
Liberty	1	2%
Brantley	1	2%
Florida		
Nassau	2	4%

[1] Out of the 198 survey packets mailed, a total of 7 (3.5%) survey packets were not deliverable due to either wrong address information or change of address.

III. DATA ANALYSIS

Next, I discuss the data analysis. This comprises summary statistics of key variables, estimation of for-hire recreational fishing earnings, operating cost/expenditure, net revenue, and economic impact analysis. Survey data were entered into Microsoft Excel and organized and processed in R software. Except for economic impact analysis, all summary statistics are generated in either Microsoft Excel or R software. The economic impact analysis, however, was performed using IMPLAN Pro Software. Details on these are discussed below. Finally, results are presented in graphs and tables.

Estimating Earnings (Cash Flow), Expenditure (Cash Outflow), and Net Revenue

Earnings are the revenues accruing to charter fishing businesses through trip sales and tips. Survey information on number of monthly trips, trip fee, tip, and number of passengers per trip were used to compute total annual earnings for responding operators. Summary statistics including mean, minimum, maximum, median, and standard error were then derived.

Expenditures are the costs incurred while operating for-hire recreational fishing vessels. Here, operating expenditures for estimating annual cash outflow includes cost of vessel fuel, trip supply cost (bait, ice, food and drinks, and tackle), repair and maintenance, insurance, advertisement, local and federal fees, dockage fees, crew labor cost, and loan repayments. Like earnings, summary statistics are computed for the expenditure components.

Average net revenue to charter fishing operators is determined as the difference between mean annual cash flow and mean annual cash outflow.

Economic Impact Analysis

This subsection discusses the approach used to estimate the economic impact of the charter fishing sector. The economic impact of Georgia's for-hire fishing fleet goes beyond the direct employment, income, and revenues of the sector. That is, when for-hire fishing operators purchase goods and services to maintain and operate their vessels, they trigger further economic impacts. The companies/industries that supply the goods and services also source goods and services from secondary sources who in turn purchase goods and services from other suppliers. This process constitutes the indirect effect of the for-hire fishing sector spending. Furthermore, it is expected that incomes paid to employees of the secondary industries will be used to purchase goods and services from the economy, generating an induced effect. Thus, the flow of industry-to-industry demand and supply of goods and services continues until all the goods and services are sourced from outside Georgia. While the estimation of direct impact of the for-hire fishing sector is straightforward, determination of the indirect and induced effect requires further modelling.

Regional Input-Output Model

To measure the indirect and induced effects, I use IMPLAN's regional input-output (I-O) model as used in past related studies (Bota 2022; Holland *et al*., 2012; Lichtkoppler 2002). The I-O model is a linear modeling technique which examines the economic cycle of production by

measuring the relative relationship between the flow of an industry's inputs and resultant flow or destination of outputs in an economy (Grealis 2017). Mathematically, the I-O model can be derived as:

$$X = Z + Y \tag{1}$$

where X is gross output, Y is final demand, and Z is an inter-industry transaction table which shows intermediate sales between industries. The input requirement for each industry to produce a unit of output is computed as $a_{ij} = \frac{z_{ij}}{x_i}$ (Leontief 1986). Calculating the input requirement for each industry results in a matrix of technical coefficients, represented as $A = \frac{Z}{X}$. Substituting AX for Z in equation 1 and solving for X gives equation 2 which is the traditional Leontief input-output model.

$$X = (I - A)^{-1} \times Y \tag{2}$$

where I is the identity matrix[2], A is the technical coefficient or direct requirement matrix, and $(I - A)^{-1}$ is the Leontief inverse or the multiplier matrix. I-O models are driven by multipliers (IMPLAN Group 2022a). The multipliers are rates that describe how additional spending in an economy generates additional economic activity in the broader economy. As mentioned earlier, the direct effects are the initial values (e.g., sales/expenditure) to which the multipliers are applied and trigger the indirect and induced effects.

The IMPLAN system further breaks down the direct, indirect, and induced effects into employment impact (full-and part-time jobs supported or created), labor income, total value added (sum of labor income and proprietor income), and output/sales. Although five types of multipliers exist within the IMPLAN software, IMPLAN Group recommends the Type SAM Multiplier because it is consistent with reality. Type SAM multiplier is computed as the sum of direct, indirect, and induced effects divided by the direct effects (IMPLAN Group 2022a).

Two modelling techniques can be used within the IMPLAN software to determine the economic impact of a sector or industry. That is, the "Inbuilt-model" approach and "Analysis-By-Parts" (ABP) approach. The "Inbuilt-model" combines industry output/sales data with IMPLAN's I-O data to estimate the economic impact. While this approach is the simplest and most attractive way of measuring economic impact/contribution of an industry change in IMPLAN (Bota 2022), estimates could be biased downward, especially because industry representatives may under-report revenues. The ABP, on the other hand, requires industry spending/expenditure patterns information derived from the industry's production budget and surveys.

In this report I utilize the two different approaches to determine the economic impact of Georgia's for-hire fishing sector. However, I elect to report and discuss results from the ABP in

[2] An identity matrix is a square matrix with ones on the principal diagonal and all other elements zeros.

the main text and relegate estimates from the "Inbuilt-model" to the appendix.[3] That is, to accurately estimate the economic contribution/impact of Georgia's for-hire fishing sector, first, for each expenditure type, I create a linear production function as the ratio of the expenditure and output (revenue) (IMPLAN Group, 2022b) and assign these ratios to the most appropriate IMPLAN commodity sector within IMPLAN software (see Tables 2 and 3). The ratios serve as the sector's intermediate input spending coefficients within the IMPLAN software. License fees/taxes (payments to government institutions) are excluded from determining the indirect and induced contribution/impact analysis. The proportions of spending that occurs locally (local purchase percentages) are also adjusted for each commodity based on the Georgia SAM values to account for imports and leakages (IMPLAN Group, 2022b). Furthermore, for expenditures in the retail sector, including food and beverage stores (IMPLAN code #400), gasoline stations (IMPLAN code #402), ice (IMPLAN code #406), and sporting goods, hobby, book, and music stores (IMPLAN code #404), retail margins are applied (see Tables 2 and 3) to apportion values for manufacturing, transportations and wholesale distribution as recommended (IMPLAN Group, 2022c and Holland et al 2012). Retail margin values were obtained from IMPLAN Group and ranged between 0.2 to 0.5 (IMPLAN Group, 2022c). I then set the event year in the IMPLAN software to 2017 to correspond with the IMPLAN's data year and used Type SAM multipliers. Because the for-hire fishing sector is only a subsect of IMPLAN 's "other amusement and recreation (IMPLAN code #496)" industry, the final model was not constrained for economic contribution analysis (IMPLAN Group, 2022d). Finally, a single region analysis was processed within the IMPLAN software and results were generated and exported in excel format. All monetary values are reported in 2022-dollar values.

[3] For the "Inbuilt-model" approach, I combine estimated total annual revenue of the sector with information on economic structure of the state of Georgia in 2017 (IMPLAN Software). Specifically, I assigned sales revenue to IMPLAN's "other amusement and recreation (IMPLAN code #496)" industry of which "fishing guide service" is a sector. I set the event year to 2017 to match IMPLAN's data year and opts for a Type SAM Multipliers.

Table 2. 12 months operating expenditures used to compute economic contribution/impact considering resident charter fishing operators

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($1000)	Percent local	Expense Share
Boat Fuel (retail margin)	402	Retail-Gasoline stores	109.2 ±32	100%	0.004
Boat Fuel (production)	156	Petroleum refineries	2,165.3 ±634.5	94.3%	0.088
Repair and Maintenance	508	Personal and household goods repair and maintenance	667.10 ±165.9	100%	0.027
Bait	017	Commercial fishing (Bait)	4,935.18 ±863.8	100%	0.201
Ice (retail margin)	406	Retail-Miscellaneous store retailers	306.1 ±53.6	100%	0.013
Ice (production)	107	Ice (except dry ice) manufacturing	664.5 ±116.5	100%	0.027
Food/drinks (retail margin)	400	Retail-Food and beverage stores	164.6 ±28.8	100%	0.007
Food/drinks (production)	106	Beverages, soft drink, manufacturing	357.3 ±62.5	98%	0.015
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	860.6 ±150.6	100%	0.035
Tackle (production)	385	Fishing tackle and equipment manufacturing	1,868 ±326.9	99.5%	0.076
Insurance	437	Insurance carries, except direct life	334.6 ±35.4	100%	0.014
Advertisement	457	Advertising, public relations, and related services	275.9 ±59.7	100%	0.011
Dockage/Boat Launch	496	Other amusement and recreation industry	217.5 ±43.9	100%	0.009
		Value added components			
Labor income		Employment compensation	7,465.3 ±1,668.8	100%	0.304
Proprietor income		Proprietor income	4,322.1 ±4,244	100%	0.176
License fees/Taxes		Taxes	71.1 ±10	100%	0.003
Total			24,784.2		1

Table 3. 12 months operating expenditures used to compute economic contribution/impact considering resident and non-resident charter fishing operators

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($1000)	Percent local	Expense Share
Boat Fuel (retail margin)	402	Retail-Gasoline stores	117.5 ±34.4	90%	0.004
Boat Fuel (production)	156	Petroleum refineries	2,330.1 ±682.8	84.3%	0.088
Repair and Maintenance	508	Personal and household goods repair and maintenance	717.9 ±178.6	90%	0.027
Bait	017	Commercial fishing (Bait)	5,310.7 ±929.5	90%	0.201
Ice (retail margin)	406	Retail-Miscellaneous store retailers	329.4 ±57.7	90%	0.013
Ice (production)	107	Ice (except dry ice) manufacturing	715 ±125.1	90%	0.027
Food/drinks (retail margin)	400	Retail-Food and beverage stores	177.1 ±31	90%	0.007
Food/drinks (production)	106	Beverages, soft drink, manufacturing	384.5 ±67.3	88%	0.015
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	926 ±162.1	90%	0.035
Tackle (production)	385	Fishing tackle and equipment manufacturing	2,010.1 ±351.8	89.5%	0.076
Insurance	437	Insurance carries, except direct life	360 ±38.1	90%	0.014
Advertisement	457	Advertising, public relations, and related services	296.9 ±64.2	90%	0.011
Dockage fee/Boat Launch	496	Other amusement and recreation industry	234.1 ±47.3	90%	0.009
		Value added components			
Labor income		Employment compensation	8,033.3 ±1,795.7	90%	0.304
Proprietor income		Proprietor income	4,651 ±4,566.9	90%	0.176
Licenses/Taxes		Taxes	76.5 ±10.4	90%	0.003
Total			26,669.9		1

Monte Carlo Simulation

So far economic contribution/impact values have been constructed assuming that the sample data is a representation of the population. To further assess uncertainty of the estimates, I perform Monte Carlo simulations[4] to generate a sequence of independent random numbers based on the sample data distributions of the variables and their parameters (mean and standard deviation). I then derive the mean and standard errors from the simulated data, interpolate to the population totals and then combine this information with data from IMPLAN to compute lower and upper bound estimates of economic contribution/impact of for-hire fishing operations in Georgia. Monte Carlo simulation helps in reducing uncertainty in estimates, especially in small sample cases.

First, assessment of the variables' sample data suggests that except for proprietor income, all the variables of interest follow log normal distributions. For proprietor income I assume a normal distribution (Figure A). Also shown in Figure A are examples of log normal distributions of some variables. The distributions of all the expenditure variables are available on request.

For each variable of interest, using the sample mean and standard deviation as parameters and assuming a log normal distribution (except for proprietor income), I simulate 10,000 random numbers and then compute the means and standard errors for each variable of interest. Monte Carlo simulations and computations of mean and standard errors are performed in R software. Overall, except for the lower and upper bounds, economic impact estimates constructed using simulated data are parallel to estimates reported in the main text. Economic impact estimates from simulated data are reported in the appendix of the report, specifically in Tables C-H.

IV. RESULTS

The results of the charter fishing survey are presented and discussed below in five sections. The first section outlines background and sociodemographic information about charter fishing operators, including their perceptions of COVID-19 impact on the sector. The second section describes the business ownership style, structure, and operations of the charter fishing industry. The third section describes the primary vessel and trip characteristics of the sector. The fourth section presents summary results on earnings, cost/expenditure, and net revenue. Finally, results on economic impact estimates are presented.

[4] Monte Carlo simulation is a statistical technique where a computer algorithm is used to generate a set of random numbers with the same data distribution as the original data and a statistical analysis used to compute outcomes such as means, standard errors (Bonate 2001; Raychaudhuri 2008).

Background Information

This section focuses on discussing background information including age, work experience, reasons why operators/captains entered or remained in the charter fishing business, perceptions of COVID-19 impact on for-hire fishing businesses, and participation in extension education. For age distribution of for-hire fishing captains, results presented in Table 4 suggest that on average, charter captains are in the mature working age group. The average age is about 50 years while the median age is 49 years. The youngest captain is 21 years while the oldest captain surveyed is 81 years. Also presented in the same table are results on captains' years of experience in the charter fishing sector. The results indicate that the average captain in the for-hire fishing sector has about 12 years of experience. The years of experience, however, range between 1 and 44 years. The median of experience is 9 years.

Table 4. Age and years of experience

	Observations	Mean	Minimum	Maximum	Median	Std. Dev.
Age	55	50.69	21	81	49	14.57
Years in business	55	12.29	1	44	9	11.53

Using a four-point scale (1=Highest through 4=Lowest) charter fishing operators were also asked to rank four reasons why they entered or remained in the charter fishing sector. The reasons included, *help people enjoy fishing*, *like the work*, *primary source of income*, and *secondary source of income*. For briefness, discussion focuses on the highest rank (in blue color). Results presented in Figure 1 shows that 16 operators entered charter fishing business mainly to help people enjoy fishing. About 15 operators indicated they entered the business mainly because they like it. In terms of income, 11 operators suggested they entered because it is the secondary source of income while 2 suggested charter fishing business is a primary source of income.

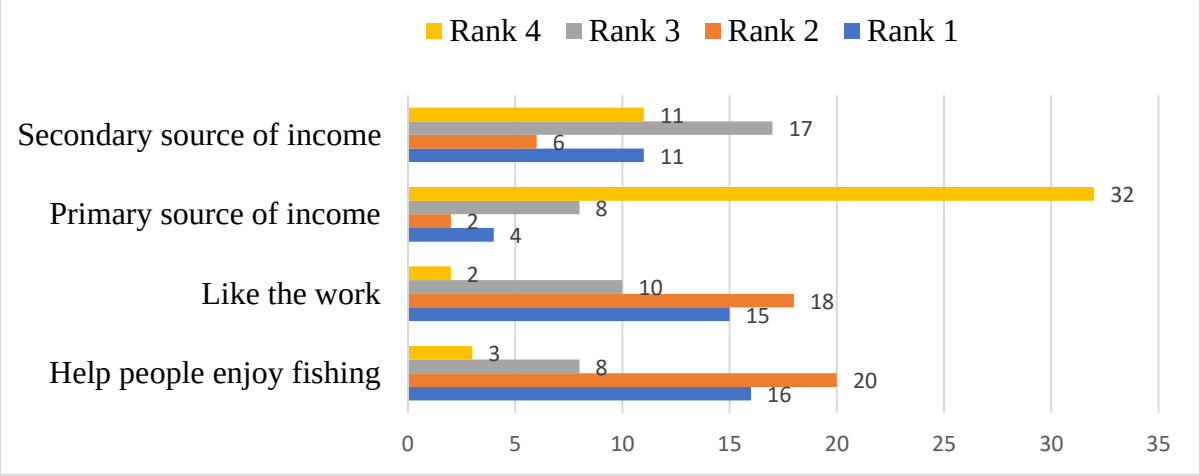

Figure 1. Reasons for entering/remaining in charter fishing business (n=47)

Figure 2 presents charter fishing operators' perceptions of COVID-19 impact on charter fishing businesses. Studies suggest that COVID-19 had adverse impact on various businesses

and industries (Apedo-Amah 2020; Meyer, Prescott, and Sheng 2022), including the tourism and recreation industry (Lee and Chen 2022; Abbas, Mubeen, and Raza 2021). Regarding the for-hire fishing sector in Georgia, survey results show that majority (about 54%) of respondents perceive that total cost of operating charter fishing vessel either increased or increased substantially during the COVID-19 pandemic. Furthermore, majority (about 60%) perceive a decline in revenue and profit. However, majority (about 51%) of the charter fishing operators also perceive that the pandemic did not affect the efficiency at which they operated their business.

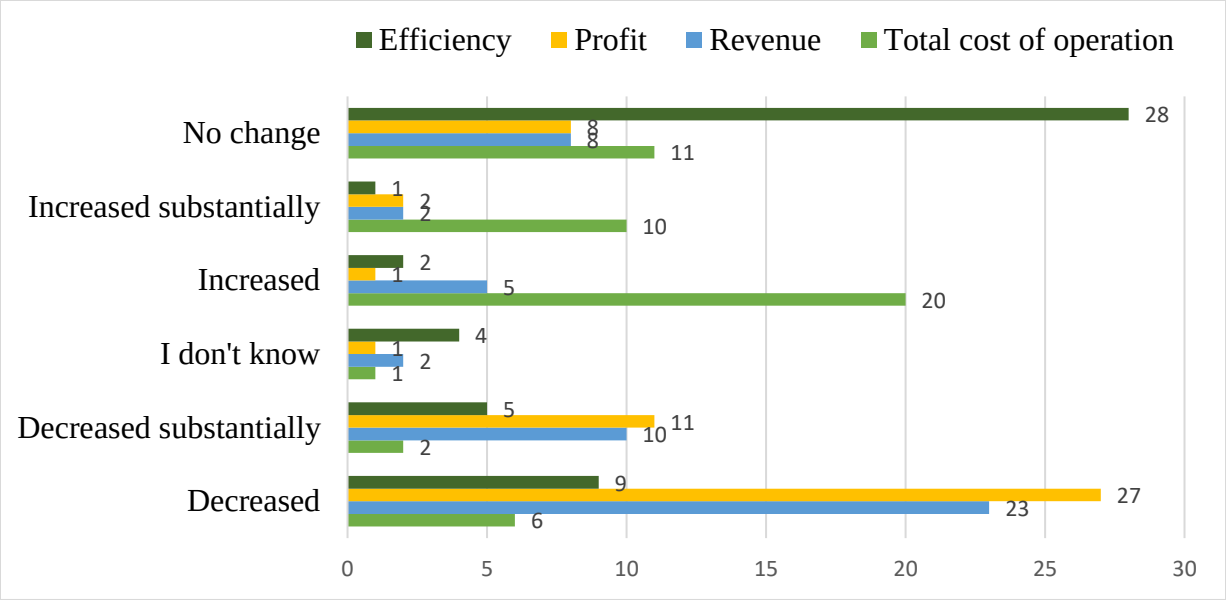

Figure 2. Impact of COVID-19 on charter fishing businesses (n=50)

In addition to these perceptions, for-hire fishing captains were asked to indicate their typical annual sales prior to COVID-19 pandemic. Survey results presented in Table 5 suggest that majority (60%) of the responding charter fishing operators made between $10,001-$100,000 in annual sales prior to COVID-19. About 23% of responding operators also made less than $10,001 sales per annum pre-COVID-19 while very few (6%) operators made annual sales that exceeded $100, 000.

Table 5. Typical annual sales before COVID-19

Annual sales	Number of respondents	Proportion
$1-$1000	4	7%
$1,001-$5,000	5	9%
$5,001-$10,000	3	6%
$10,001-$25,000	11	20%
$25,001-$50,000	9	16%
$50,001-$100,000	13	24%
$100,001-$250,000	2	4%
$500,001-$1,000,000	1	2%

Charter fishing operators were also asked if they had participated in any extension education in the past three years. Result from the survey, presented in Figure 3, shows that majority (86%) of responding operators have not participated in any extension education in the last three years. Only 1% responding operators have participated in extension education in the past three years. This information presents an opportunity to design extension education programs that focus on this group of people.

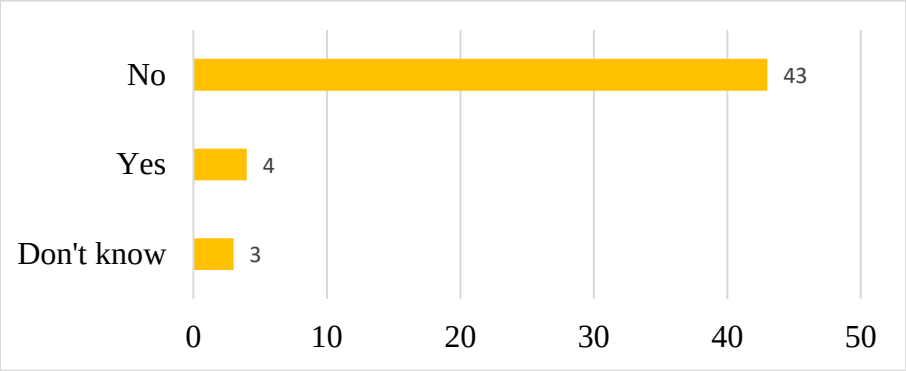

Figure 3. Participation in extension education (n=50)

Business Ownership, Structure, and Operating Characteristics

Turning to business ownership, structure, and operations, the survey results, as presented in Table 6, show that majority of charter fishing captains are sole proprietors (71%), own (87%) the boat/vessel they operate and operate the vessel on part-time basis (58%). The ownership style, sole proprietorship, indicates most for-hire fishing businesses are owned and run by one person where there is no legal distinction between the owner and the business entity. A few surveyed captains also mentioned they operate as either a limited liability cooperation (13%) or partnership (4%). Majority (58%) of charter fishing captains surveyed operate on part-time basis while 35% operate the boat/vessel full-time.

Table 6. Ownership and organization Characteristics

	Number of respondents	Proportion
Ownership type		
Sole proprietorship	39	71%
Corporation	7	13%
Partnership	4	7%
Organization structure		
Own the boat	48	87%
Leased/rented boat	1	2%
Salary employee	1	2%
Freelance hire per trip	1	2%
Boat operation		
Full-time	19	35%
Part-time	32	58%

Furthermore, Table 7 presents information on the additional services offered by charter fishing businesses. These services include the provision of ice, tackle, fishing license, bait, fish cleaning, food/bottled water, and photography. Specifically, in addition to the fishing guide service, majority (more than 50%) provide ice, tackle, licenses, bait, fish cleaning, food, and bottled water, and serve as photographers. These services are included in the passengers' fare. Only 2% of the respondents indicated that they provide lodging if requested.

Table 7. Additional Services Offered

Service item	Number of Respondents	Proportion
Ice	50	91%
Tackle	49	89%
Licenses	48	87%
Bait	47	85%
Fish cleaning	44	80%
Food/Bottled water	30	55%
Photos/videos	30	55%
Lodging	1	2%

Primary Vessel and Trip Characteristics

Presented in Table 8 are the summary of primary vessel and trip characteristics. The average primary vessel has a length of 23 feet, 1 engine with a horsepower of about 255 and carries about 6 passengers. The smallest boat in the for-hire fishing fleet is about 16 feet long has one engine with 1 outboard motor that has a horsepower of 60 while the largest vessel is 33 feet long has 3engines and a horsepower of 750. Survey results also suggest that the average for-hire fishing captain makes about 92 trips annually (3 a week and 11 a month), carries 3 passengers per trip with no additional crew, travels about 28miles for a trip, and burns about 103 gallons of boat fuel per trip. Majority (56%) of the captains undertake half day trips, mostly inshore (64%) and spend, on average, 5.8 hours during the trip. For the average for-hire fishing captain, about 81% of total trip hours are spent inshore where 22% of this trip hours are spent visiting inshore artificial reef sites. About 12% of the surveyed captains make trips to nearshore while 9% make trips to offshore. Furthermore, captains who make offshore trips spend about 35% of the total trip hours at offshore artificial reef sites.

Table 8. Primary vessel and trip characteristics

	Number of respondents	Proportion	Mean	Min.	Max.	Median	Std. D.
Boat characteristics							
Boat length (feet)	51		23.35	16	33	23	4.15
Number of engines	51		1	1	3	1	0.43
Horsepower	51		255.2	60	750	240	150.1
Carrying capacity	51		6.69	2	12	6	2.36
Additional crew							
Full time crew	16		0.38	0	1	0	0.5
Part time crew	19		0.68	0	3	1	0.82
Paid family crew	16		0.31	0	1	0	0.48
Unpaid family crew	14		0.14	0	1	0	0.36
Number of trips							
Week	32		3.31	0	12	2.5	2.88
Month	38		11.66	1	50	8	11.42
Year	47		92.68	4	280	95	74.06
Trip characteristics							
Full day trip	20	36%					
Half day trip	31	56%					
Trip duration	51		5.84	3	11	6	2.03
Inshore trip	35	64%					
Nearshore trip	7	13%					
Offshore trip	5	9 %					
% of total trip hours spent inshore	43		81	1	100	100	35.68
% of total trip hours spent nearshore	18		30.78	0	100	10	41.8
% of total trip hours spent offshore	11		32.73	0	100	10	41.97
% of total trip hours spent at inshore artificial reef	22		22	0	100	0	39.17
% of total trip hours spent at offshore artificial reef	21		35	0	100	0	47.18
Distance travelled (miles)	50		27.66	3	150	21.5	24.39
Boat fuel (gallons)	49		103.38	12	700	56	138.81
Number of passengers	48		3	1	6	3	1.23

Earnings, Expenditures, and Net Revenue

As expected, customer payments are the largest source of revenue to the charter fishing operator. As shown in Table 9, the average charter fishing operator's annual revenue is about $133,596. This, however, ranges from as low as $7,812 and as high as $1,197,000. Decomposing annual revenue into trip fee and tip, the average operator's annual trip fee is $125,705 (ranges between $6000 and $1,152,000) while annual tip is about $7,891 (ranges between $0 and $60,300). Overall, the estimated revenue reflects self-reported annual sales prior to COVID-19 (Table 5).

Table 9. Summary of annual revenue

	Number of respondents	Mean ($)	Min ($)	Max ($)	Median ($)	Std. error ($)
Revenue	49	133,596.61	7,812	1,197,000	66,636	28,313.69
Trip fee	49	125,705.5	6,000	1,152,000	64,800	27,464.43
Tip	49	7,891.10	0	60,300	4,848	1,773.89

Summarized in Table 10 are the cost associated with typical items required to operate and maintain for-hire fishing vessel. For the average charter fishing business, the largest annual operating expense are, trip supply (bait, ice, food/drinks, and tackle), labor income, fuel/oil, and repairs and maintenance respectively. While loan repayment is included in Table 10, it is not an opearting cost (Lichtkoppler and Kuehn 2002) and so it is excluded from the annual average operating cost. Also, because few responding operators indicated they rent a boat to operate their business, boat rental cost is excluded from the annual average operating cost. The reported estimates, however, vary. For example, some operators purchase as low as $240 of fuel/oil and as high as $144,000 fuel/oil annually. Liability insurance, advertisement, and docking fee/boat luanch are other significant operating cost associated with the for-hire fishing sector.

Table 10. Summary of annual operating cost

Item	Number of respondents	Mean ($)	Min ($)	Max ($)	Median($)	Std. error ($)
Fuel/oil	49	12,361.5	240	144,000	4,800	3,622.5
Labor income	49	40,572	1,932	309,120	19,320	9,069.4
Trip supply cost	49	49,761.8	1,200	244,800	19,296	8,709.3
Bait	49	26,821.6	646.81	131,947	10,400.5	4,594.3
Ice	49	5,274.8	127.2	25,948.8	2,045.4	923.2
Food/drinks	49	2,836.4	68.4	13,953.6	1,099.9	496.4
Tackle	49	14,829	357.61	72,950.4	5,750.2	2,595.4
Boat rent cost	10	620.3	300	1,501	300	527.1
Insurance	44	1,818.3	396	7500	1,320	192.4
Repair cost	48	3,625.5	0	30,000	1,200	901.8
License/fees	45	386.2	10	2,000	230	52.5
Docking fee	55	1,182.1	200	10,000	651	238.7
Advertisement	28	1,499.4	10	10,000	500	324.3
Loan repayment	15	1,168.3	93.8	3,020.8	701.14	253.3

Furthermore, presented in Table 11 is the annual net revenue for the average charter fishing operator. Results presented considers the case of loan repayment, boat rental, and without loan repayment or boat rental. This result, however, does not account for depreciation and purchasing cost of a charter fishing vessel/boat. Overall, on average, a charter fishing operator/business makes about $30,000 net revenue per annum. Charter fishing operators with loan repayments or boat rental expense, however, are expected to have a little lower net revenue compared to operators without boat loan or rental expense.

Table 11. Annual cash flow for the average charter fishing operator

Revenue/Expense	Operators with boat loan repayments	Operators who rent boat	Operators without boat loan/rental payments	Number of respondents
Average Revenue ($)	133,596.6	133,596.6	133,596.6	49
Cash Flow Needs ($)				
Average operating costs	102,333.9	102,333.9	102,333.9	49
Average loan payments	1,168.3			15
Average boat rentals		620.3		10
Cash Needed ($)	103,502.2	102,954.24		
Net Revenue ($) to operator	30,094.3	30,642.4	31,262.7	

Economic Impact Results

Georgia's for-hire fishing sector confers positive economic impacts/contributions. In this report, although economic impacts are estimated using the "Inbuilt-model" and ABP approach in IMPLAN, I only discuss results for the ABP approach and relegate results for the "Inbuit-model" to the appendix (Table A1). Furthermore, results based on the Monte Carlo Simulations are reported in the appendix (Tables A3 and A5). The economic impacts are represented by employment, labor income, value-added and output. Employment represents the number of full time and part time jobs created by a sector. Labor income comprises all forms of employment income, including employee compensation and proprietor income. Value-added is the difference between a sector's total output and the cost of its intermediate inputs. Output is the total dollar value of production or service by a sector for a given period (Parajuli et al., 2018; Jolley et al., 2020). All economic impact estimates are reported in 2022-dollar values.

Table 12 reports the economic impact for only resident licensed for-hire fishing operators (184) and all (residents + non-residents) licensed for-hire fishing operators (198). Overall, estimates for only residents and all operators are similar. Although non-resident operators are licensed in Georgia, they could be purchasing goods and services out of state to operate their vessel. Lower and upper bounds are presented in parenthesis in the text. Lower and upper bound estimates are constructed based on estimated standard errors (see Tables 2 and 3).

First, focusing on residents, results displayed in Table 12 suggest that the for-hire fishing sector directly employs about 368 part-time and full-time workers and generates an output of approximately $24.8 (between $16.3 and $33.3) million. This results in an estimated additional

indirect effect of 204 part-time and full-time workers and about $14.8 (between $11.8 and $17.8) million in output, and an induced effect of 95 part-time and full-time workers and approximately $13.7 (between $7.9 and $19.5) million in output in the broader Georgia economy. Thus, overall, these results equate to a total employment impact of 667 part-time and full-time workers and a total economic impact of about $53.3 (between $36 and $70.5) million.

Turning attention to "all" licensed operators in Georgia, economic impact reported in Table 12 shows that direct purchases of goods and services of approximately about $26.6 (between $17.5 and $35.8) million further generates an indirect output of about $19.2 (between $12.7 and $19.1) million, and an induced impact of about $15.8 (between $8.4 and $20.9) million in the broader Georgia economy. That is, the estimated overall economic output is $61.7 (between $38.7 and $75.9) million. The sector directly employs 396 part-time and full-time workers. The direct spending of the for-hire fishing sector indirectly supports 253 workers. The induced employment impact is 110 part-time and full-time workers. This leads to a total employment impact of 759.

Table 12. Economic impacts of charter fishing sector: using ABP approach: Considering only residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	368	7.5	11.9	24.8
Indirect Effect	204	3.5	8.1	14.8
Induced Effect	95	4.4	8.1	13.7
Total Effect	667	15.4	28.0	53.3
Imputed Multiplier	0.8	1.1	1.4	1.1
		Mean - 1 SE		
Direct Effect	368	5.8	5.9	16.3
Indirect Effect	167	2.8	6.5	11.8
Induced Effect	55	2.5	4.7	7.9
Total Effect	589	11.2	17.1	36.0
Imputed Multiplier	0.6	0.9	1.9	1.2
		Mean + 1 SE		
Direct Effect	368	9.1	17.8	33.3
Indirect Effect	241	4.2	9.6	17.8
Induced Effect	135	6.2	11.5	19.5
Total Effect	745	19.6	38.9	70.5
Imputed Multiplier	1.0	1.1	1.2	1.1

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Table 13. Economic impacts of charter fishing sector: using ABP approach: Considering residents and non-residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	396	8.0	12.8	26.7
Indirect Effect	253	5.1	10.7	19.2
Induced Effect	110	5.1	9.4	15.9
Total Effect	759	18.2	32.9	61.8
Imputed Multiplier	0.9	1.3	1.6	1.3
		Mean - 1 SE		
Direct Effect	396	6.2	6.4	17.5
Indirect Effect	179	3.1	7.0	12.7
Induced Effect	59	2.7	5.0	8.5
Total Effect	634	12.0	18.4	38.7
Imputed Multiplier	0.6	0.9	1.9	1.2
		Mean + 1 SE		
Direct Effect	396	9.8	19.1	35.8
Indirect Effect	260	4.5	10.3	19.1
Induced Effect	146	6.7	12.4	21.0
Total Effect	801	21.0	41.9	75.9
Imputed Multiplier	1.0	1.1	1.2	1.1

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Satisfaction with the Charter Fishing Sector

Using a likert scale that ranges from extremely dissatisfied to extremely satisfied, charter fishing operators were asked to indicate their overal level of satisfaction with charter fishing operation/business and regulations in Georgia. Figures 4 presents responding operators' statisfaction levels with charter fishing business. A total of 17 out of 48 responding operators indicated they are neither satisfied nor dissatisfied with the charter fishing business. Thirteen (out of 48) are somewhat satisfied while 12 are extremely satisfied. Three operators indicated they are somewhat disastisfied. Three additional operators indicated they are extremely dissatisfied with for-hire recreational fishing business in Georgia.

Figure 4. Satisfaction with charter fishing business (n = 48)

Regarding satisfaction with charter fishing regulations, Figure 5 indicates that generally, majority (23) of responding operators are dissatisfied with the regulation of the sector. A total of 18 responding operators are generally satisfied while 5 are neither satisfied nor dissatisfied.

Figure 5. Satisfaction with charter fishing regulations (n = 46)

Concerns about the Charter Fishing Sector

A total of 40 responding charter operators provided various concerns about the sector. These concerns can be grouped under two headings: those related to fish limits and regulations as well as other concerns. To save space I present some selected concerns in Table 14. However, these concerns reflect those not presented here. Majority of the concerns are related to fish limits. Generally, operators want fish limits lowered to conserve fish stock. Other concerns include high fuel cost, unlicensed operators, and high cost of liability insurance.

Table 14. Charter fishing operators'concerns about the sector

Fish limits and regulations concerns
Biggest concern is current GA limits on game fish. Flounder limit is too short, and quantity is too high. Sea Trout and Red Drum quantities are also too high.
I believe GA should have lower limits and a smaller slot size for redfish. I would support a limit of 1 redfish per angler and a 17"-22" slot. I would support a trout limit of 5 fish per person with a minimum of 15" and a limit of one fish per boat over 20". I would support paying more in fees and taxes if the state would use those collected funds only for enforcement of harvesting regulations.
I have concerns that if we do not change our limits for the state of Ga, we will continue to hurt our fishery on the coast. Other states have made it clear with their regulations that bigger fish can be raised by moving the amount that can be kept to a lower number. Other states fisheries are way better than ours. I've fished several myself.
Georgia inshore limits have not changed in nearly 30 years. The limits that are in place no longer correlate appropriately with the number of anglers. I have seen a significant impact on the number of red drum on flats and in creeks. Specifically, within the last five years.
The DNR is tone deaf to charter captains reporting Redfish number diminishing and refuses to do anything constructive. The sum of the limits of redfish from Florida, South Carolina and North Carolina combined equal 4 fish, our limit is 5. Our fishery is suffering because the DNR refuses to listen to the guides who are seeing the population decline firsthand.
I am concerned with preservation of this industry and ecosystem. I believe current regulations on creel limits are outdated and ill managed. Why can't we adjust to match neighboring states? Add the question about money spent in neighboring states due to experienced decline in fish population in GA. Lower the limits on all in-shore species!
Other concerns
Charter fishing in GA is difficult due to the constantly changing weather conditions. It is unlikely that picking a date out will yield a good day to fish. It's more like you need customers who are ready to go with only hours' notice when conditions are "right".
Georgia does not protect the speckled trout or redfish like they should. I find a noticeable difference in fishing Florida waters versus Georgia waters in quality and quantity of fish.
Unlicensed charter operators. Many charters with no coast guard. Licensed operators
Federal government is regulating us out of business. Need fewer regulations plus better enforcement. Fuel costs will necessitate a price increase this season. This will result in fewer trips
I've about stopped chartering this year, spend money getting ready for trip, it gets canceled due to covid-19. Hard to find bait, cost of fuel, fish limits
Shrimpers' bycatch. No snapper seasons. Too many sharks. Over regulated.
High fuel prices

Charter Fishing Operators' Recommendations

Table 15 presents some proposals from responding operators. Like Table 14, proposals are grouped under two headings - fish limits and regulations and general proposals. Regaiding fish limits and regulation, a common proposal is lowering fish limits. That is, charter fishing

operators recommend that authorities lower fish size limits amd quantity. Operators opine that the current limits are causing decline in fish stock thereby threatening charter fishing businesses. Further, operators are in support of increasing recreational and charter fishing educational efforts, expansion of artificial reefs, fish stocking, increasing license period to annual basis, strict enforcement of regulations, and discounted group liability insurance for charter fishing operators.

Table 15. Recommendations

Fish limits and regulations
Stricter limits for small harvest amounts of all fish and more enforcement.
I would like to see Georgia match one of our neighbors: SC or FL. Why are we so far behind our neighboring states on limit changes and restrictions?
Speckled trout creel limit should be reduced to 10 pieces. Size limit raised to 15". Redfish creel should be reduced to 2 pieces. Slot limit moved to 16"-25".
Red fish boat limit of 15 fish. Redfish minimum size of 15. Red fish-allowed to keep one fish 23-27. Seatrout limit reduction to 10 per angler. Seatrout boat limit of 30 fish.
Spotted seatrout is 15 daily limits. Should be changed to 8 per person or 20 per boat. Trout are over fished. There should be more days to keep red snapper, they are plenty. The nearshore artificial reefs, within 20 miles need work most structure is sanded in. Reefs need new structure also.
To my understanding, red snapper regulations are based on old data and extremely influenced by the commercial fishing industry.
Revise creel limits for red drum, sea trout and flounder. Make tarpon catch and release only.
Reduce number of red drum limit from 5 per person to 2 per person.
Lower red fish limit. Raise minimum on red fish to at least 16-13.
Give us a rea red snapper season!
General recommendations
Emphasis on conservation! Reduce the limits! Put more money in the science. Improve the environment - Artificial reefs inshore, education, etc. These surveys are excellent. I only hope that the data obtained can be put to good use.
The fishing industry in general needs assistance with stocking, updated bag/size limits. Both our neighboring states have utilized methods to greatly improve their inshore fishery and the fishing and charter industries have flourished. Unfortunately, Georgia still seems to be the "kill them All" State.
The change has to be Georgia. DNR has to do what it’s supposed to be doing (protect Georgia natural resources) before it’s too late. And here is a question everyone in Georgia want to hear, please ask … why they are doing nothing to protect our fisheries.
Open dialogue between operators and law enforcement. Captains loose respect for DNR officers when they are engaged in fishing with customers and must stope fishing to allow DNR to do a safety check. Checking for illegal fish is appreciated and necessary. captains are aware of the rules.
Living on the Stateline of FL/GA, it isn't fair that I have to pay out of state fees for my fishing license. It would also be nice if the license was good for a year. Instead of starting in April. Florida goes date to date for a year.

Table 15 Continued

Some type of discounted group insurance for captains of private operated vessels maybe subsidized by state DNR.
Fewer regulations, better enforcement, allow us to sell our catch more easily, and of course give us better weather.
Those captains running charters without license of any kind must be caught.
As far as regulations go, I think we are doing a good job.
FL and GA reciprocate their guide licensing.

V. SUMMARY AND CONCLUSIONS

The for-hire recreational (charter) fishing sector has become important in recreational fisheries management in Georgia. Yet detailed information, particularly economic impact information, about the sector is lacking. Occasional assessment of the economic impact and contribution of the charter fishing sector to the state's economy is critical for data-driven decision making. This study has four purposes. Three of the purposes focus on the collection of background information including operating characteristics, and economic data and estimation of net operating revenue as well as economic impact of charter fishing sector on Georgia's economy. The fourth purpose is to create educational materials including factsheet/infographic for public consumption.

Survey data suggest that the average responding charter fishing operator is 50 years old and has 12 years of charter fishing experience. A plurality (16) of operators opined that they engage in charter fishing business primarily so people can enjoy fishing. Most of the operators reported a decrease in revenue and profit, perhaps due to increased cost of operating charter fishing vessels, during the COVID-19 pandemic. Most (77%) captains operate charter fishing business as sole proprietors, and most of these operators own the charter fishing vessels (82%), operate on part-time basis (64%), do not typically hire full-time crew, and provide additional fishing services such as fish cleaning, and photography. On average, charter fishing captains operate fishing vessels that are 23 feet long, have a carrying capacity of 6 passengers, and have one outboard motor that has a horsepower of about 255. Furthermore, survey results suggest that the average operator generates about $125,705 (ranges from $6,000 to $1,1252,000) per annum sales revenue, about $7,891 (ranges from $0 to $60,300) per annum in tips, incur about $102,333 (ranges from $7,432 to $590,261) as annual operating cost, and generates about $30,000 annual net revenue.

Economic impact metrics generated from IMPLAN's Input-Output model show that in 2021, the charter fishing sector contributed about $53.3 (between $36 and $70.5) million in gross output to Georgia's economy. This value includes approximately $24.7 (between $16.2 and $33.2) million in direct effect, $14.7 (between $11.8 and $17.7) million in indirect effect, and $13.6 (between $7.8 and $19.4) million in induced effect. The sector supports about 667 full time and part-time jobs. These estimates are slightly higher if I combine licensed residents and non-resident charter fishing operators. The charter fishing sector further supports other industries

and businesses. The top five industries and services, by employment, that directly rely on the for-hire fishing sector are the commercial fishing (bait) industry, retail sporting goods industry, repair and maintenance shops, retail miscellaneous stores, and sporting and athletic goods and manufacturing industries.

Survey results also show that generally, most (52%) responding charter fishing operators are satisfied with charter fishing business in Georgia. However, most operators (57%) are dissatisfied with Georgia's charter fishing regulations. Overall, operators recommend that authorities lower fish size and quantity limits. Operators opine that the current limits are causing decline in fish stock thereby threatening charter fishing businesses. Further, operators are in support of increasing recreational and charter fishing educational efforts, expansion of artificial reefs, fish stocking, increasing license period to annual basis, strict enforcement of regulations, and discounted group liability insurance for charter fishing operators. majority of the concerns are related to fish limits.

Overall, the findings in this report suggest that the charter fishing sector contributes substantially to Georgia's economy. To the extent that the sector depends on fish stock, a decline in fish stock, and hence decrease in demand for fishing guide services, could lead to significant economic losses. Thus, effective measures to sustain the charter fishing sector need to be implemented, including setting sustainable fish limits that would support charter fishing operations in the long run, while considering anglers' fishing needs. Authorities should design extension programs that would reach out to charter fishing operators and provide related educational information that will ultimately ensure sustainable use of the state's marine resources. Collaborations between authorities, charter fishing operators, resource managers, researchers, and stakeholders should be encouraged to identify charter fishing operators' needs and how to addresses those needs effectively. Charter fishing operators should be encouraged to represent the sector in advisory committees and decision-making processes.

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APPENDIX

Table A. Economic impacts of charter fishing sector using "Inbuilt-model" approach: Considering residents

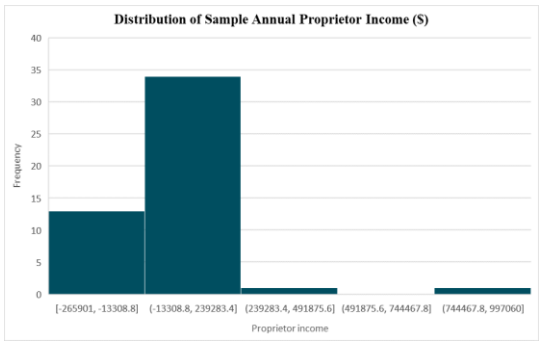
Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	349	12.3	18.5	25.8
Indirect Effect	65	3.3	6.2	10.4
Induced Effect	96	4.4	8.2	13.9
Total Effect	510	20.0	32.8	50.1
		Mean-1 SE		
Direct Effect	275	6.1	11.0	20.4
Indirect Effect	51	2.6	4.9	8.2
Induced Effect	54	2.5	4.6	7.9
Total Effect	381	11.2	20.5	36.4
		Mean + 1 SE		
Direct Effect	423	18.5	25.9	31.2
Indirect Effect	78	4.0	7.5	12.6
Induced Effect	138	6.3	11.8	19.9
Total Effect	639	28.8	45.1	63.7

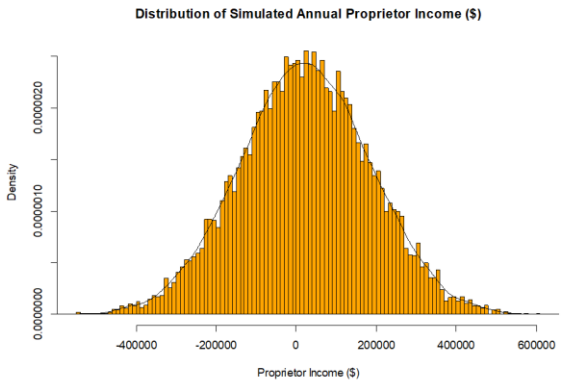
Note: Except for employment, all values are in millions of dollars. SE is standard error.

Table B. Economic impacts of charter fishing sector using "Inbuilt-model" approach: Considering residents and non-residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	376	13.3	19.9	27.8
Indirect Effect	70	3.5	6.6	11.2
Induced Effect	103	4.8	8.8	14.9
Total Effect	549	21.5	35.3	53.9
		Mean-1 SE		
Direct Effect	296	6.6	11.8	21.9
Indirect Effect	55	2.8	5.2	8.8
Induced Effect	58	2.7	5.0	8.5
Total Effect	410	12.1	22.0	39.2
		Mean + 1 SE		
Direct Effect	455	21.2	29.2	33.6
Indirect Effect	84	4.3	8.0	13.6
Induced Effect	156	7.2	13.3	22.6
Total Effect	695	32.7	50.5	69.7

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.





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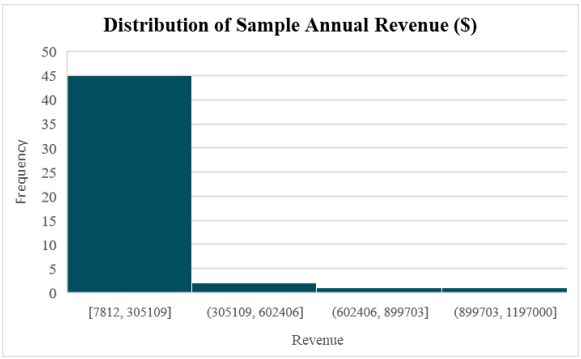

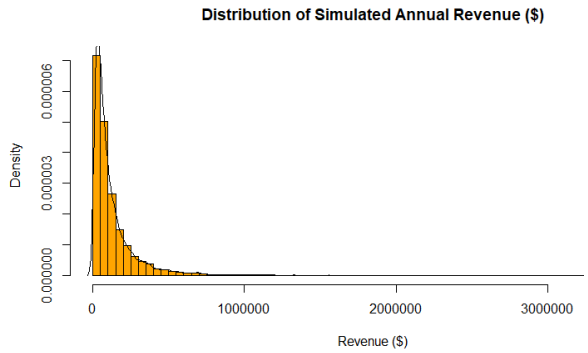

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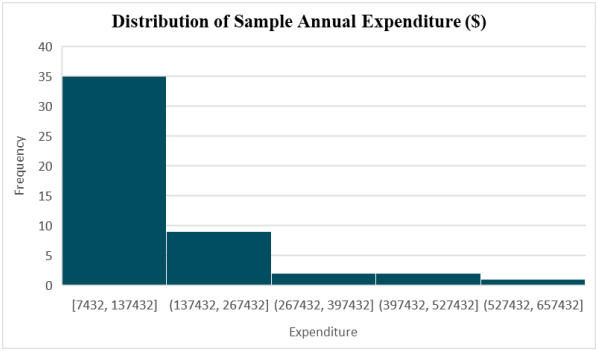

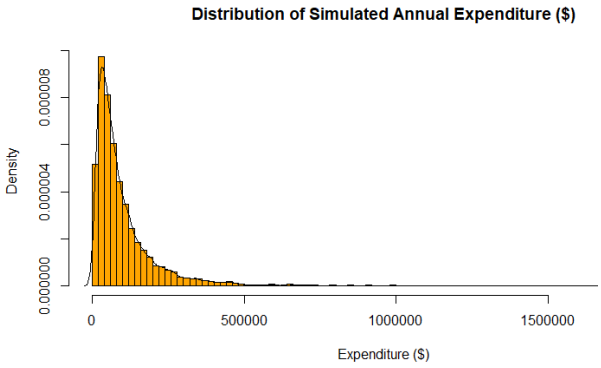

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Figure A. Distributions of sample and simulated data

Table C. Economic impacts of charter fishing sector using "Inbuilt-model" approach and Monte Carlo simulated revenue data: Considering residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	347	3.5	9.6	25.6
Indirect Effect	64	3.3	6.1	10.3
Induced Effect	43	2.0	3.7	6.2
Total Effect	454	8.7	19.4	42.2
		Mean - 1 SE		
Direct Effect	342	3.7	9.7	25.3
Indirect Effect	63	3.2	6.0	10.2
Induced Effect	44	2.0	3.8	6.4
Total Effect	449	8.9	19.5	41.9
		Mean + 1 SE		
Direct Effect	352	7.4	13.6	26.0
Indirect Effect	65	3.3	6.2	10.5
Induced Effect	66	3.1	5.7	9.7
Total Effect	483	13.8	25.5	46.2

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Table D. Economic impacts of charter fishing sector using "Inbuilt-model" approach and Monte Carlo simulated revenue data: Considering residents and non-residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	373	13.0	19.5	27.6
Indirect Effect	69	3.5	6.6	11.1
Induced Effect	101	4.7	8.7	14.6
Total Effect	543	21.1	34.8	53.4
		Mean-1 SE		
Direct Effect	368	12.5	19.0	27.2
Indirect Effect	68	3.5	6.5	11.0
Induced Effect	98	4.5	8.4	14.2
Total Effect	534	20.5	33.8	52.4
		Mean + 1 SE		
Direct Effect	379	13.4	20.1	28.0
Indirect Effect	70	3.6	6.7	11.3
Induced Effect	104	4.8	8.9	15.1
Total Effect	553	21.8	35.7	54.3

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Table E. 12 months operating expenditures used to compute economic impact considering resident charter fishing operators: Based on Monte Carlo simulated data

Expenditure	IMPLAN© Sector	IMPLAN© Sector Description	Expense ($1000)	Percent local	Expense Share
Boat Fuel (retail margin)	402	Retail-Gasoline stores	108.1 ±2	100%	0.004
Boat Fuel (production)	156	Petroleum refineries	2,143 ±39.4	94.3%	0.088
Repair and Maintenance	508	Personal and household goods repair and maintenance	662 ±10.6	100%	0.027
Bait	017	Commercial fishing (Bait)	4,914 ±57.9	100%	0.201
Ice (retail margin)	406	Retail-Miscellaneous store retailers	304.8 ±3.6	100%	0.013
Ice (production)	107	Ice (except dry ice) manufacturing	661.6 ±7.8	100%	0.027
Food/drinks (retail margin)	400	Retail-Food and beverage stores	163.9 ±1.9	100%	0.007
Food/drinks (production)	106	Beverages, soft drink, manufacturing	355.8 ±4.2	98%	0.015
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	856.9 ±10.1	100%	0.035
Tackle (production)	385	Fishing tackle and equipment manufacturing	1,8560 ±21.9	99.5%	0.076
Insurance	437	Insurance carries, except direct life	333.7 ±2.5	100%	0.014
Advertisement	457	Advertising, public relations, and related services	274.2 ±3.9	100%	0.011
Dockage/Boat Launch	496	Other amusement and recreation industry	216.3 ±2.9	100%	0.009
		Value added components			
Labor income		Employment compensation	7,417.9 ±108.7	100%	0.304
Proprietor income		Proprietor income	4,094.9 ±299.5	100%	0.168
License fees/Taxes		Taxes	70.8 ±0.7	100%	0.003
Total			24,437.9		1

Table F. 12 months operating expenditures used to compute economic impact considering resident and non-resident charter fishing operators: Based on Monte Carlo simulated data

Item	IMPLAN© Sector code	IMPLAN© Sector Description	Expense ($1000)	Percent local	Expense Share
Boat Fuel (retail margin)	402	Retail-Gasoline stores	116.3 ±2.1	90%	0.004
Boat Fuel (production)	156	Petroleum refineries	2,306.1 ±42.4	84.3%	0.088
Repair and Maintenance	508	Personal and household goods repair and maintenance	712.3 ±11.4	90%	0.027
Bait	017	Commercial fishing (Bait)	5,287.9 ±62.4	90%	0.201
Ice (retail margin)	406	Retail-Miscellaneous store retailers	328 ±3.9	90%	0.013
Ice (production)	107	Ice (except dry ice) manufacturing	711.9 ±8.4	90%	0.027
Food/drinks (retail margin)	400	Retail-Food and beverage stores	176.4 ±2.1	90%	0.007
Food/drinks (production)	106	Beverages, soft drink, manufacturing	382.8 ±4.5	88%	0.015
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	922.1 ±10.9	90%	0.035
Tackle (production)	385	Fishing tackle and equipment manufacturing	2,001.5 ±23.6	89.5%	0.076
Insurance	437	Insurance carries, except direct life	359.1 ±2.6	90%	0.014
Advertisement	457	Advertising, public relations, and related services	295.1 ±4.2	90%	0.011
Dockage fee/Boat Launch	496	Other amusement and recreation industry	232.8 ±3.1	90%	0.009
		Value added components			
Labor income		Employment compensation	7,982.3 ±117	90%	0.304
Proprietor income		Proprietor income	4,406.5 ±322.3	90%	0.168
Licenses/Taxes		Taxes	76.2 ±0.7	90%	0.003
Total			26,297.3		1

Table G. Economic impacts of charter fishing sector using APA approach and Monte Carlo simulated expenditure data: Considering residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	368	7.4	11.6	24.4
Indirect Effect	210	3.7	8.4	15.6
Induced Effect	97	4.5	8.3	14.0
Total Effect	676	15.6	28.3	54.1
Imputed Multiplier	0.8	1.1	1.4	1.2
		Mean - 1 SE		
Direct Effect	368	7.3	11.2	23.9
Indirect Effect	208	3.6	8.2	15.1
Induced Effect	94	4.3	8.0	13.6
Total Effect	670	15.2	27.4	52.6
Imputed Multiplier	0.8	1.1	1.5	1.2
		Mean + 1 SE		
Direct Effect	368	7.5	12.0	25.0
Indirect Effect	213	3.7	8.5	15.8
Induced Effect	100	4.6	8.5	14.5
Total Effect	681	15.8	29.1	55.3
Imputed Multiplier	0.9	1.1	1.4	1.2

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Table H. Economic impacts of for-hire fishing sector using APA approach and Monte Carlo simulated expenditure data: Considering residents and non-residents

Impact type	Employment	Labor Income	Value Added	Output
		Mean		
Direct Effect	396	8.0	12.5	26.3
Indirect Effect	226	3.9	9.0	16.8
Induced Effect	105	4.8	8.9	15.1
Total Effect	727	16.7	30.4	58.2
Imputed Multiplier	0.8	1.1	1.4	1.2
		Mean-1 SE		
Direct Effect	396	7.9	12.0	25.7
Indirect Effect	224	3.9	8.9	16.6
Induced Effect	102	4.7	8.7	14.7
Total Effect	721	16.4	29.6	56.9
Imputed Multiplier	0.8	1.1	1.5	1.2
		Mean + 1 SE		
Direct Effect	396	8.1	12.9	26.9
Indirect Effect	224	3.7	9.0	16.3
Induced Effect	58	2.7	5.0	8.4
Total Effect	679	14.5	26.8	51.6
Imputed Multiplier	0.7	0.8	1.1	0.9

Note: Except for employment and imputed multiplier, values are in millions of dollars. SE is standard error.

Information Sheet for Participation in a Research Study

Principal Investigator: Dr. Eugene Frimpong

Title of Study: Estimating the Economic Impact of For-Hire Charter Business in Georgia

Dear Captain, you are invited to participate in a research study. This form includes information about the study and contact information if you have any questions.

WHY ARE WE DOING THIS RESEARCH?

The purpose of this research is to provide insight into the operational structure of the for-hire charter business and assess the extent to which for-hire charter businesses contribute to Georgia's Economy. Despite the important role for-hire charter businesses play in the recreational fishing and tourism industry, there is no current economic data to understand and estimate its impact on Georgia's economy. This survey will provide the information required to understand the operational characteristics and the contributions of the for-hire charter business in Georgia.

WHAT SHOULD I KNOW?

If you agree to participate in this study, you will be asked to complete a survey. The survey asks questions related to your business. Specifically, we will collect some background information, information on your business operating and boat characteristics, last trip expenses, last trip revenue, perceptions on the charter business in Georgia and recommendations. No personally identifiable information will be collected. The survey should take 15 minutes to complete. We do not anticipate any risk from completing this survey. You do not have to take part in this research, and you can stop at any time. The investigators may withdraw you from this research if circumstances arise which warrant doing so.

CONFIDENTIALITY

Any data we collect will be used solely for this research. No personally identifiable information will be collected, and the researchers will code the transcripts using numbers, not names. The information you provide will be uploaded to a secure password-protected computer at the researcher's office at University of Georgia.

WHO CAN I TALK TO?

If you would like to report a complaint or concern about this research study, contact Dr. Eugene Frimpong, at eugene.frimpong@uga.edu or call at 912-262-2379. You are not waiving any legal claims, rights, or remedies because of your participation in this research study.

Please print out a copy of this information sheet for your records

Consent: If you decide to participate in this study, continue with the survey by responding to the questions that follow next. ***After you have completed the survey, put it in the return envelope (the return envelope is attached to the mail packet) and mail it to us at no cost at the nearest United States Postal Service (USPS) office. Alternatively, you may complete the survey online by typing*** https://ugeorgia.ca1.qualtrics.com/jfe/form/SV_cHBCpRjDu1H9ryC ***in your web browser***.

Background Information

Q1. What is your age (years)? _____

Q2. Which state do you consider to be your home state? *Check one*:

- ○ Georgia
- ○ Other (Please specify) _____

Q3. Which Georgia county do you consider to be the home port for the charter boat/vessel? *Check one*:

- ○ Effingham
- ○ Chatham
- ○ Bryan
- ○ Liberty
- ○ Long
- ○ Mcintosh
- ○ Wayne
- ○ Glynn
- ○ Brantley
- ○ Charlton
- ○ Camden
- ○ Other (Please specify) _____

Q4. How many years have you been in the charter business? _____

Q5. Why did you enter/remain in the charter business? *Rank from 1 through 4. 1 is the highest*:

Help people enjoy fishing	
Like the work	
Primary source of income	
Secondary source of income	

Q6. How has the coronavirus disease (COVID-19) impacted your business? *Check all that apply:*

	Increased substantially	Increased	Decreased	Decreased substantially	No change	I don't know
Total cost of operation	○	○	○	○	○	○
Revenue	○	○	○	○	○	○
Profit	○	○	○	○	○	○
Efficiency	○	○	○	○	○	○
Other (Please specify)	○	○	○	○	○	○

Q7. Please indicate the scale of your charter business by the typical annual sales before the effect of coronavirus disease (COVID-19). *Check one:*

- ○ $1-$1000
- ○ $1,001-$5,000
- ○ $5,001-$10,000
- ○ $10,001-$25,000
- ○ $ 25,001-$50,000
- ○ $50,001-$100,000
- ○ $100,001-$250,000
- ○ $250,001-$500,000
- ○ $500,001-$1million
- ○ Over $1 million

Q8. Have you participated in any Extension education in the past 3 years? *Check one:*

- ○ Yes
- ○ No → (Skip to Question 10)
- ○ I don't know

Q9. Who organized the meeting? *Check all that apply:*

- ○ University of Georgia Marine Extension
- ○ Georgia Department of Natural Resources
- ○ Other (Please specify) _____

Q10. Have you contacted (through phone calls, emails, text messages, etc.) University of Georgia Marine Extension agent to make inquiries and other information requests about the charter business? *Check one:*

- ○ Yes
- ○ No
- ○ I don't know

Information about the Ownership, Organization and Operation of Your Charter Business

Q11. Which one of the following best characterizes your charter business? *Check one:*

- ○ Charter (6-pack) fishing
- ○ Party boat
- ○ Diving tours
- ○ Dinner cruises
- ○ Other (Please specify) _____

Q12. How would you describe the ownership structure of your charter business? *Check one:*

- ○ Sole proprietorship
- ○ Partnership
- ○ Corporation
- ○ Other (Please specify) _____

Q13. How would you describe your business organization structure? *Check one:*

- ○ Own the boat(s)
- ○ Leased/rented boat(s)
- ○ Salary employee
- ○ Freelance hire per trip
- ○ Other (Please specify) _____

Q14. How would you describe the operation of your boat/ vessel? *Check one:*

- ○ Part-time
- ○ Full-time

Q15. In addition to the base charter service, which of the following services do you offer? *Check all items that apply:*

- ○ Tackle
- ○ Fish cleaning
- ○ Bait
- ○ Licenses
- ○ Ice
- ○ Photos/videos
- ○ Lodging
- ○ Food/bottled water
- ○ Other (Please specify) _____

Q16. How many crew /employees do you have? *Please indicate the number of crew/employees in each category*:

Full time crew	
Part time crew	
Paid family crew	
Unpaid family crew	

Q17. How many charter trips do you undertake in a typical?

Week	
Month	
Year	

Information about your Primary Boat/Vessel

Q18. What is the length (in feet) of the boat/vessel used in your last trip? _____

Q19. What is the total horsepower of the boat/vessel used in your last trip? _____

Q20. How many engines does the boat/vessel have? _____

Q21. What is the passenger carrying capacity of your boat/vessel? _____

Q22. Which year did you purchase the boat/vessel? _____

Q23. What was the age (years) of the boat/vessel at the time of purchase? _____

Information about Last Trip and Expenditure/ Operating Cost

Q24. How long did your last trip last? *Check one:*

- ○ Full day trip
- ○ Half day trip
- ○ overnight trip/ multiday trip

Q25. What was the duration (hours) of the last trip? _____

Q26. Where did you make the trip to? *Check all items that apply:*

- ○ Inshore/coastal trip
- ○ Nearshore trip
- ○ Offshore trip

Q27. What percentage (%) of the total trip hours from your last trip was spent in

Inshore/coastal	
Nearshore	
Offshore	

Q28. What percentage (%) of the total trip hours from the last trip was spent at

Inshore artificial reef site	
Offshore artificial reef site	

Q29. What was the distance (in miles) travelled? _____

Q30. How many gallons of boat/vessel fuel was used in your last trip? _____

Q31. What is the approximate amount ($) you paid for fuel for the last trip? _____

Q32. How many crews did you use on your last trip? *Please indicate the number of crew in each category:*

Full time crew	
Part time crew	
Paid family crew	
Unpaid family crew	

Q33. How much ($) did you pay per crew labor for the last trip? *Please indicate the cost per crew in each category:*

Full time crew	
Part time crew	
Paid family crew	

Q34. Which range below contains the approximate amount you purchased the boat/vessel? *Check one:*

- ○ $10,000-$20,000
- ○ $20,001-$30,000
- ○ $30,001-$40,000
- ○ $40,001-$50,000
- ○ $50,001-$60,000
- ○ $60,001-$70,000
- ○ $70,001-$50,000
- ○ $80,001-$150,000
- ○ Over $150,000

Q35. If you rented the boat/vessel, which range below contains the approximate amount per day you rent the boat/vessel? *Check one:*

- ○ $300-$700
- ○ $701-$1,100
- ○ $1,101-$1,500
- ○ $1,501-$1,900
- ○ Over $1,900

Q36. If you purchased the boat/vessel, is the boat/vessel financed through a bank? *Check one:*

- ○ Yes
- ○ No → (Skip to Question 39)
- ○ Other (Please specify) _____

Q37. If the boat/vessel is financed through a bank, do you have an outstanding loan on the boat/vessel? *Check one:*

- ○ Yes
- ○ No

Q38. If you have an outstanding loan to pay for the boat/vessel, how much ($) is the outstanding loan? _____

Q39. Do you have insurance coverage for the boat/vessel? *Check one:*

- ○ Yes
- ○ No → (Skip to Question 43)

Q40. How much do you pay ($) monthly as insurance premium? _____

Q41. What is the amount ($) of insurance coverage on your vessel? _____

Q42. If your boat/vessel is financed through a bank and you have insurance coverage for the boat/vessel, was insurance a requirement to obtain the loan for the boat/vessel? *Check one:*

- ○ Yes
- ○ No

Q43. Which range below contains the approximate amount ($) you pay monthly for boat/vessel service and repairs? *Check one:*

- ○ $0-$99
- ○ $100-$499
- ○ $500-$999
- ○ $1000-$1,499
- ○ $1,500-$1,999
- ○ $2000-$2,499
- ○ $2,500-$2,999
- ○ $3,000-$3,499
- ○ Over $3,499

Q44. Were the service and repairs covered by insurance? *Check one:*

- ○ Yes
- ○ No

Q45. How much ($) do you pay annually for federal and state vessel license? _____

Q46. Which range below contains the approximate amount ($) you pay annually for docking? *Check one:*

- ○ $200-$500
- ○ $501-$800
- ○ $801-$1,100
- ○ $1,101-$1,400
- ○ Over $1,400

Q47. Which range below contains the approximate amount ($) you spend monthly on trip supplies including bait, tackle, food, bottled water, and ice? *Check one:*

- ○ $100-$200
- ○ $201-$300
- ○ $301-$400
- ○ $401-$500
- ○ $501-$600
- ○ Over $600

Q48. Did you advertise the trip? *Check one:*

- ○ Yes
- ○ No → (Skip to Question 50)

Q49. How much ($) did you spend on advertisement? _____

Q50. There are 5 coastal counties adjacent to the coastline in Georgia. The designers of this survey appreciate the time and effort you devote to completing our survey. We feel it is important to reward those who give this commitment by i) differentiating them from respondents who speed through surveys without properly reading the questions and ii) rewarding thoughtful, engaged respondents accordingly. To demonstrate that you have read this question carefully, please select the Glynn option below.

In which county is your business located? *Check one:*

- ○ Chatham county
- ○ Liberty county
- ○ Mcintosh county
- ○ Glynn county
- ○ Camden county

Information about Revenue

Q51. How much ($) did you charge as trip fee per person on your last trip? _____

Q52. Does the trip fee include additional services such as tackle, fish cleaning, bait, licenses, ice, photo or video, food and bottled water, and lodging? *Check one:*

- ○ Yes → (Skip to Question 54)
- ○ No

Q53. If the trip fee does not cover additional services, how much ($) did you charge per person?

Tackle	
Fish cleaning	
Bait	
Licenses	
Ice	
Photos/videos	
Lodging	
Food/bottled water	
Other (Please specify)	

Q54. How many passengers were on your last trip? _____

Q55. Which range below contains the approximate amount ($) you received as tip? *Check one:*

- ○ $0-$0.99
- ○ $1-$50
- ○ $51-$100
- ○ $101-$150
- ○ $151-$200
- ○ $201-$250
- ○ Over $250

Satisfaction with and Concerns about the Charter Fishing Sector

Q56. Overall, what is your level of satisfaction with the

	Extremely dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Extremely satisfied
charter fishing business in Georgia	○	○	○	○	○
charter fishing regulations in Georgia	○	○	○	○	○

Q57. What are your concerns about the charter fishing industry in Georgia?

_____
_____
_____
_____

Your Recommendations

Q58. What changes would you like to see in the charter fishing industry in Georgia?

_____
_____
_____
_____
_____

We thank you for your time spent taking this survey.

Kindly put the completed survey in the return envelope (the return envelope is attached to the mail packet) and mail it to us at no cost at the nearest United States Postal Service (USPS) office.

ECONOMIC CONTRIBUTIONS OF

SALTWATER RECREATIONAL FISHING IN GEORGIA

UGA Marine Extension and Georgia Sea Grant received funding from the Georgia Department of Natural Resources Coastal Resources Division to assess the economic contributions of saltwater recreational fishing to Georgia's coastal economy.

A survey was disseminated to anglers to collect saltwater fishing-related expenditure data as well as demographic and geographic data. Results of the study are provided below.

IN 2022, RECREATIONAL SALTWATER FISHING ACTIVITIES...

SUPPORTED **3,217 JOBS**

PRODUCED **$155.1 MILLION** IN GDP

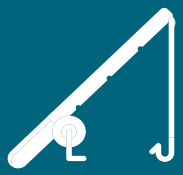
CONTRIBUTED **$310.6 MILLION** TO GEORGIA'S ECONOMY

These activities include purchasing fishing tackle, such as fishing rods, lines, and lures, while also incurring additional expenses related to transportation and food.

TOP 5 INDUSTRIES (BY EMPLOYMENT)

THAT ARE SUPPORTED BY SALTWATER RECREATIONAL FISHING

RESTAURANTS



RETAIL: SPORTING GOODS

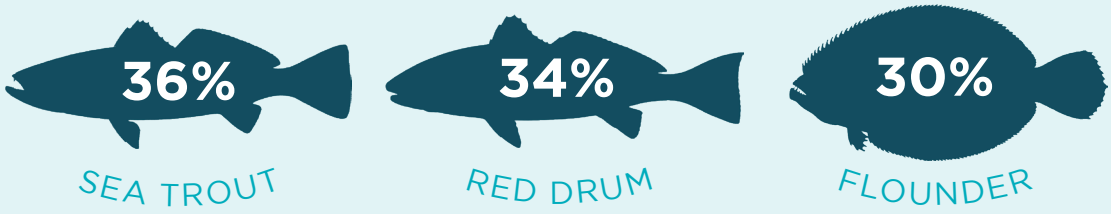
COMMERCIAL FISHING (BAIT)

RETAIL: GASOLINE

RETAIL: ALCOHOL AND BEVERAGE

RECREATIONAL FISHING **QUICK FACTS**

TOP 3 TARGETED SPECIES



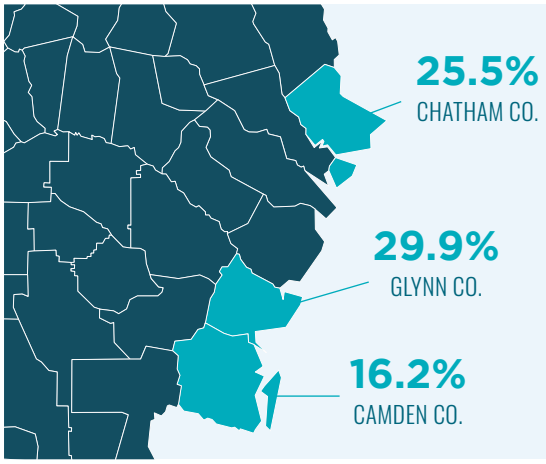
TOP 3 FISHING METHODS

50% PRIVATE BOAT FISHING

42% SHORE FISHING

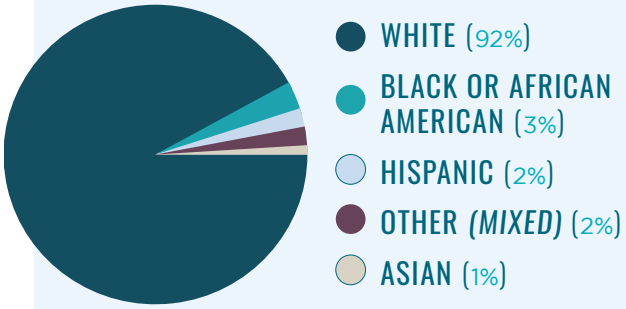
5.3% CHARTER BOAT FISHING

TOP 3 FISHING COUNTIES

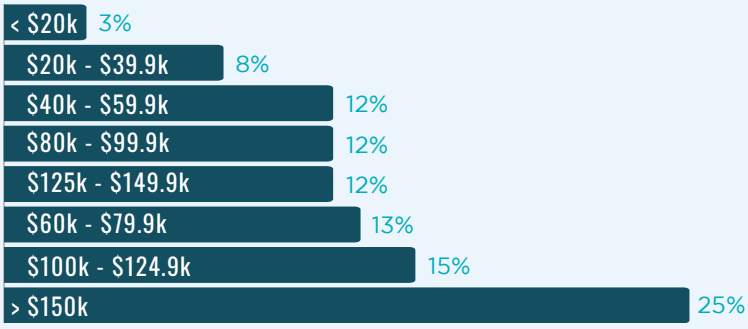


The study revealed that the average saltwater angler is about 54 years old. Most in and out-of-state anglers are white (92%), male (89%), married (85%), live in a family household (93%), have a bachelor's degree (32%), and have annual household income of $80,000 or more (64%).

PERCENTAGE OF ANGLERS BY RACE



PERCENTAGE OF ANGLERS BY INCOME



Recreational saltwater fishing provides significant economic contributions to Georgia's coastal economy. The socioeconomic information gathered through this study will be used to inform management practices that support the economic viability of the industry and the overall health of Georgia's fisheries populations.

Financial assistance is provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office for Coastal Management, NOAA and passed through the Coastal Management Program of the Department of Natural Resources. Views expressed here, however, do not reflect those of the Office for Coastal Management, NOAA, and Georgia Department of Natural Resources.

GEORGIA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA

Sea Grant

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

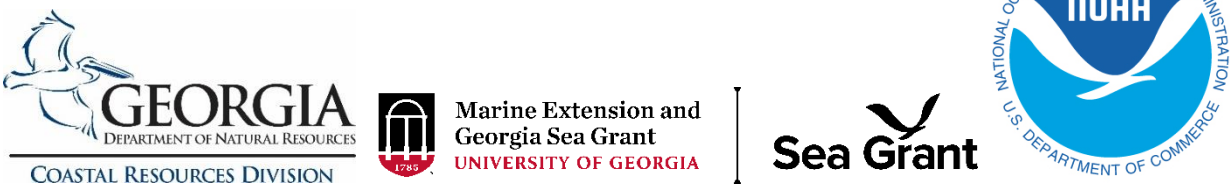
Economic Impact of Saltwater Recreational Fishing in Georgia

A report prepared for Georgia Department of Natural Resources, Coastal Resources Division

by

Eugene Frimpong, Ph.D.

Marine Extension and Georgia Sea Grant, University of Georgia



Economic Impact of Saltwater Recreational Fishing in Georgia

Report

2023

Eugene Frimpong, PhD

Marine Extension and Georgia Sea Grant, University of Georgia

EXECUTIVE SUMMARY

1. The Coastal Resources Division of the Georgia Department of Natural Resources sought socioeconomic data to gain insights into the economic significance of the saltwater recreational fishing in Georgia.

2. University of Georgia Marine Extension and Georgia Sea Grant received funding from the Georgia Department of Natural Resources Coastal Resources Division to gather socioeconomic information on Georgia's saltwater recreational fishing sector and assess the economic contributions of the sector to Georgia's economy.

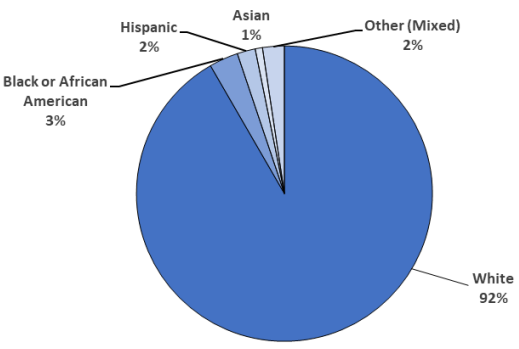
3. A survey was developed in consultation with the staff of the Georgia Department of Natural Resources Coastal Resources Division and disseminated to randomly sampled anglers to collect demographic data and saltwater fishing-related expenditures. This report summarizes the method and results from the survey.

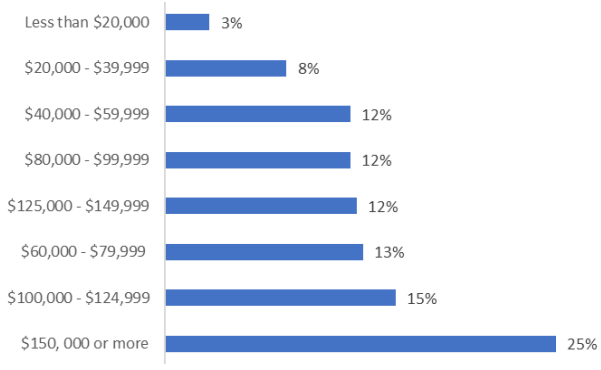
4. **Economic contributions: saltwater recreational fishing trips in Georgia supported 3,217 full or part-time jobs, contributed $310.6 million in sales, $74.4 million in labor income, and $155.1 million in gross domestic product (GDP) to Georgi's economy in 2022.**
    - Georgia residents: saltwater recreational fishing trips supported 3,039 full or part-time jobs, contributed $292.90 million in sales, $71.3 million in labor income, and $148.3 million in gross domestic product (GDP) to Georgi's economy.
    - Non-residents: supported 214 full or part-time jobs, contributed $17 million in sales, $5.1 million in labor income, and $9.2 million in gross domestic product (GDP) to Georgi's economy.

5. Expenditure: saltwater recreational anglers spent an average of $594.8 per trip on trip-related costs in 2022, with a median expenditure of $187. The top five expenditure categories by average values were as follows: lodging, with an average of $194.80 (median of $0), restaurant meals at $100.90 (median of $5), auto fuel at $96.14 (median of $47.5), tackle at $66.30 (median of $15), and boat fuel at $63.90 (median of $0).

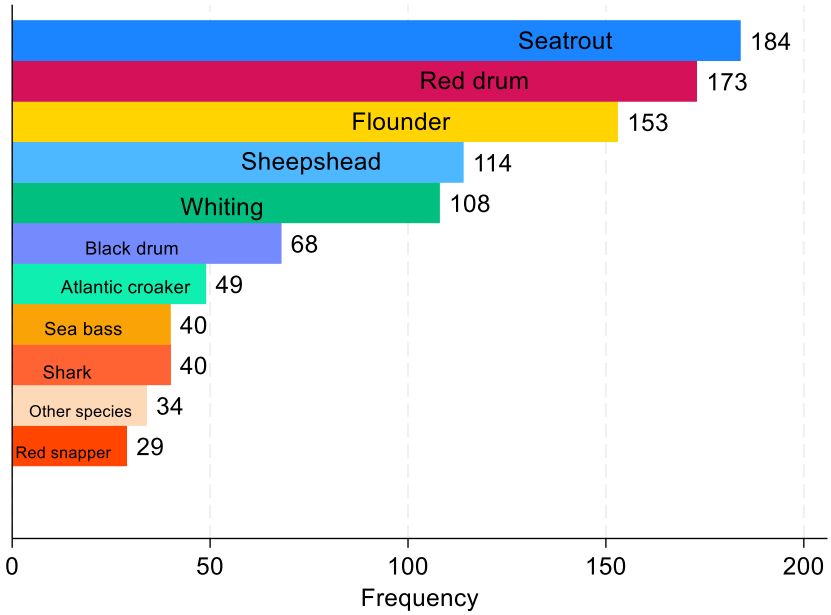
- Georgia resident saltwater anglers had an average expenditure of $565.1 per trip on trip-related expenses, with a median expenditure of $250.
    - Coastal resident saltwater anglers had an average expenditure of $273.8 on trip-related expenses, with a median expenditure of $170.
- Non-resident saltwater anglers had an average expenditure of $1,138per trip on trip-related costs, with a median expenditure of $523.5.
- Private boat fishing
    - Resident anglers spent on average $474.8 (median is $210) per trip.
        - ✓ Coastal resident anglers spent on average $312.5 (median is $ 181) per trip.
    - Non-resident anglers spent on average $908.21 (median is $245) per trip.
- Shore fishing
    - Residents spent an average of $622.1 (median is $116).
        - ✓ Coastal resident anglers spent an average of $174.9 (median is $120) per trip.
    - Non-resident anglers spent an average of $1,267.62 ($234).

6. The data revealed that the average saltwater angler is about 54 years old. Plurality of the anglers are white (92%), male (89%), married (85%), live in a family household (93%), have a bachelor's degree (32%), and have annual household income of $80, 0000 or more (64%).

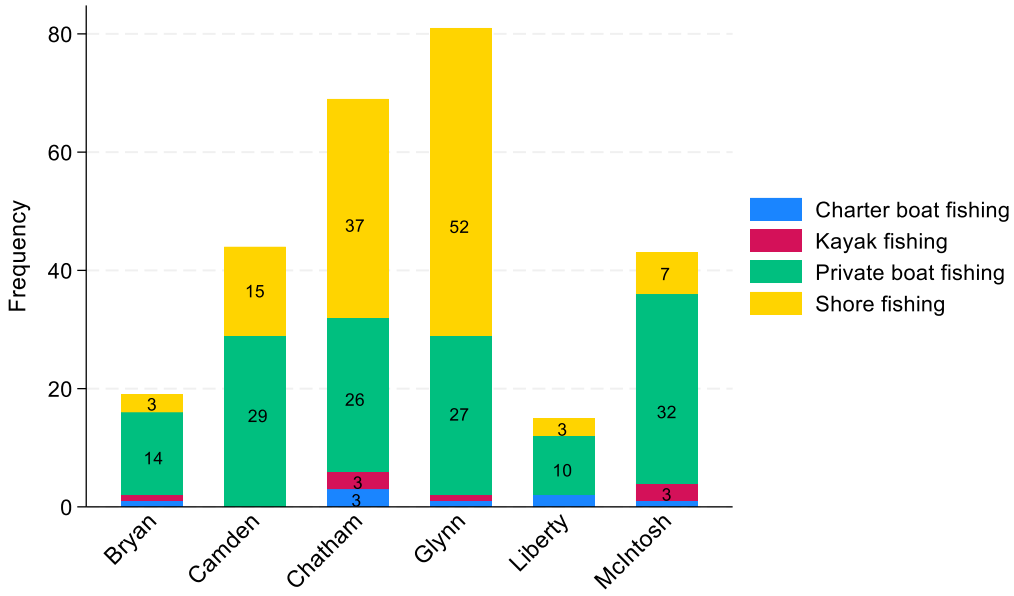




7. Top three fish species sought after are seatrout, red drum, and flounder.



8. Top three fishing destinations are Glynn County, Chatham County, and Camden County



ACKNOWLEDGEMENTS

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A special thanks goes to all saltwater anglers who participated in this study. The findings reported here would not have been possible without their voluntary willingness to participate in this study.

I would like to thank Bryan Fluech for assisting me with the survey design and review process.

Thank you to the staff of the Department of Natural Resources' Coastal Resources Division for guidance and comments on the design of the survey.

I take full responsibility for any errors or deficiencies.

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INTRODUCTION

Saltwater recreational fishing, often referred to as angling, is a popular leisure activity that involves fishing in estuarine and marine environments, such as coastal rivers, sounds, oceans, seas, and other saltwater bodies. Anglers have the option to either release, retain, or share their catches among their social circle (Pawson et al 2008). The allure of saltwater recreational fishing goes beyond the thrill of the catch; it entails a significant economic component. Anglers spend on fishing equipment, such as fishing rods, reels, bait, and tackle, while also incurring additional expenses related to transportation, lodging, and food. In the United States, the annual expenditure on marine recreational fishing is estimated to exceed 10 billion dollars (Lovel et al. 2020), thus, solidifying its position as a financially robust sector within the tourism and recreation industry.

In the pursuit of gaining insight into the multifaceted dimensions of saltwater recreational fishing in the state of Georgia, the Coastal Resources Division of the Georgia Department of Natural Resources embarked on a quest for socio-economic data. This endeavor sought to unravel the economic significance of the recreational fishing industry in the state, and ultimately contribute to enhanced management practices to ensure the long-term well-being of both the economic and ecological aspects of saltwater recreational fishing. Between September 2020 and September 2023, the Georgia Department of Natural Resources' Coastal Resources Division allocated funding to the Marine Extension and Georgia Sea Grant as part of the Coastal Incentive Grant Program for two primary purposes: (1) the collection of expenditure data from recreational anglers and the estimation of economic impacts resulting from their fishing activities, and (2) the analysis of demographic characteristics pertaining to saltwater anglers in Georgia. A noteworthy precursor to this report is the study conducted by Lovel et al. (2020), which provided valuable economic insights into saltwater recreational fishing in Georgia. Their research, based on data collected in 2017 shows that anglers spent an average of about $266 per angler day on for-hire trips, $40 on private or rental boat trips, and $51on shore trips. Furthermore, they found that in 2017, the sector supported 2,788 full or part-time jobs, and contributed $231 million in sales, $76 million in income, and $144 million in gross domestic product (GDP) to Georgia’s economy.

This report endeavors to provide the most current socio-economic data on Georgia's saltwater recreational fishing sector. As per regulations in Georgia, saltwater fishing is permitted in the expansive waters extending from the coastline to specific demarcation points, including

the crossings of several rivers and tributaries (GA Code § 27-4-1 (2022)). That is, typically, saltwater fishing transpires within the six coastal counties along the Atlantic Ocean in Georgia: Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden. These coastal regions are renowned for their natural beauty, featuring barrier islands, sandy beaches, salt marshes, dunes, and estuaries, all of which remain largely untouched and protected. Additionally, the region's temperate climate makes coastal Georgia a year-round destination for outdoor enthusiasts, including saltwater anglers.

DATA

Survey design

This report relies on a survey conducted with saltwater anglers, both Georgia residents and non-residents. Online and mail surveys were designed in consultation with stakeholders and staff of the Georgia Department of Natural Resources Coastal Resources Division. The surveys were similar in terms of content with slight modifications to account for the different modes.

The survey began with a consent letter followed by a set of screening questions that target anglers who are18 years of age or older and have participated in saltwater recreational fishing in Georgia in the previous 12 months. A section of the survey was dedicated to collecting data on anglers' fishing experience, including the mode of fishing used in the last saltwater fishing trip and the number of trips taken in a week, month, and or year. Another section of the survey was devoted to collecting information on expenditure incurred during their last saltwater fishing trip. Anglers were also asked to indicate the locations where they fished or departed in a vessel to go fishing. To this end, they were provided with maps, as shown in the survey instrument in the appendix, on which specific areas were demarcated and labeled with letters. Anglers only saw the map associated with a selected coastal county. Questions on targeted species, factors affecting choice of fishing site, and demographics were also asked. Overall, the survey contained 30 questions. The survey was designed to guarantee anonymity and encourage participants to respond to survey questions.

Sampling

The sampling frame was obtained from a database maintained by the License and Boat Registration unit of the Georgia Department of Natural Resources. This confidential list contained 387,423 anglers with valid saltwater information permit. After removing incomplete

emails and or addresses, our sampling frame consisted of 266, 570 saltwater anglers. To best represent the population, anglers were grouped as residents and non-residents. The Resident angler sample frame consisted of 242,120 (90.8%) while nonresident sample frame was 24,450 (9.2%). A random sampling technique was then applied to each group. To determine the sample size for each group, I assumed an error margin (*e*) of 5% and sample sizes generated using the formula below. The letter *z* is z-score (1.96), *s* is standard deviation (0.5), and *N* is population size. This approach resulted in a sample size of 384 for resident anglers and 378 for non-resident anglers. However, a total of 1, 500 sample sizes were used.

$$Sample\ size = \frac{\frac{z^2 \times s(1-s)}{e^2}}{1 + \left(\frac{z^2 \times s(1-s)}{e^2 N}\right)}$$

Data Collection

The data gathering process followed a tailored Dillman approach, where, if a participant had a valid email address on record, they were initially contacted via email with an invitation to access an online survey. Otherwise, a self-reported survey questionnaire that included a link to the web-based survey was mailed to anglers who did not have email addresses or had invalid email addresses. In the initial email, respondents were also given the option to request a survey packet. The packet enclosed both the survey questionnaire and a prepaid return envelope.

Given the objective of gaining insights into the fishing locations of saltwater anglers, in-person sampling was not feasible. One week after sending the initial email invitations, reminder messages were dispatched to encourage participation. The data collection phase spanned approximately five months, specifically from February 28th to July 28th. It is worth noting that, due to the survey's design prioritizing anonymity, it was impossible to ascertain who had completed and returned the survey. The survey elicited responses from a total of 626 anglers, resulting in a response rate of 41.7%. From the information provided by respondents regarding their residency or zip code, 172 were identified as Georgia residents, while 84 were from outside the state. That is, approximately half of the respondents (371) did not furnish details about their residency or zip code. Consequently, item-nonresponse to survey questions was relatively high.

ANALYSIS APPROACH

This entails describing survey variables by utilizing summary statistics generated Stata and/ or Microsoft Excel, which are then presented in tables and as graphs. Using saltwater fishing trip expenditure data from the survey, I then estimate the "economic impact" of saltwater recreational fishing in Georgia.[1] The money spent on saltwater recreational fishing circulates through the economy, leading to a multiplier effect where one dollar spent can have a more significant impact as it passes through various sectors. To capture these effects, I utilized IMPLAN's regional input-output (I-O) model (IMPLAN Group 2022a). For more information regarding IMPLAN's Input-Output (I-O) model, I recommend readers to consult the report on for-hire recreational fishing in Georgia (Frimpong 2022). The economic impact results derived from IMPLAN are presented in terms of employment, labor income, value added, and output. Employment impact quantifies the overall number of both full-time and part-time positions directly or indirectly sustained by purchases of goods and services linked to saltwater recreational fishing. Labor income encompasses both employee compensation, such as wages and salaries, and proprietor income, which includes income derived from self-employment. Value added reflects the contribution to the regional gross domestic product (GDP), particularly within the geographical context of Georgia, while output impact measures the aggregate gross sales or total output arising from saltwater recreational fishing activities within the region.

Furthermore, these impacts can be categorized into four distinct types: direct, indirect, induced, and total effects. **Direct effects** pertain to the expenditures integrated into the input-output multipliers for an impact assessment. In this context, it signifies the changes in production within the sector resulting from additional saltwater fishing trips. These production adjustments, when integrated into the IMPLAN multipliers, offer insights into the regional economic response to these changes. **Indirect effects** encompass the inter-business transactions occurring within the regional supply chain, originating from the initial sector purchases. **Induced effects** represent the

[1] Ideally this type of analysis will be referred to as "economic contribution". Nevertheless, in this report, we use the terms "impact" and "contribution" interchangeably. The key distinction lies in the fact that 'contributions' pertain to the existing state of activity, while 'impacts' typically denote alterations in the existing state.

outcomes stemming from increased household expenditures, driven by labor income. These induced effects manifest as workers in the recreational sector supply chain utilize their earnings to acquire everyday consumer goods like gasoline, groceries, utility payments, and various other commodities. The summation of the direct, indirect, and induced multiplier effects yields the total economic impacts or contributions attributed to expenditures related to saltwater recreational fishing in Georgia.

To estimate the economic impact or contribution of saltwater recreational fishing in Georgia, the IMPLAN Pro Software employs industry changes. If industry data, differentiating labor, benefits, proprietor income, and wages, were available from the survey, "analysis by parts," could also be employed. The “analysis by parts” approach involves utilizing a customized spending pattern specific to the industry to estimate the economic impact in IMPLAN (IMPLAN Group 2022b). To execute the industry change approach, total expenditures for various expenditure categories were derived using median values, as depicted in Figure 1. Subsequently, these varied expenditures were matched to IMPLAN sectors, as illustrated in Tables 1 through 7. These expenditures serve as industry sales impacts or output impacts.

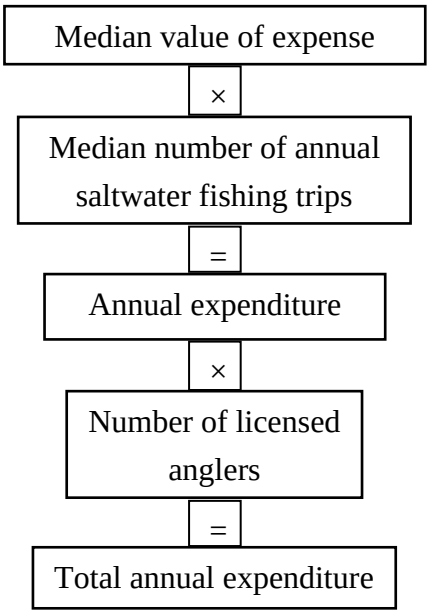

Figure 1. Estimating total annual expenditures

To allocate expenses within the retail sector, which includes gasoline stores (IMPLAN code #402), alcohol beverages, food and beverage stores, snacks (IMPLAN code #400), ice

(IMPLAN code #406), and sporting goods, hobby, book, and music stores (IMPLAN code #404), we applied retail margins, as indicated in Tables 1 through 5. These margin values were sourced from IMPLAN Group and ranged from 0.2 to 0.5 (IMPLAN Group, 2022c), following recommendations by Holland et al. (2012). I adjusted the proportions of local spending (local purchase percentages) to account for imports and leakages. Subsequently, I conducted a single-region analysis using IMPLAN's Type SAM multipliers and exported the results in Excel format. All monetary values are presented in 2023-dollar values.

Table 1. 12 months trip level expenditures used to compute economic contribution/impact considering resident and non-resident saltwater anglers.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (retail margin)	402	Retail-Gasoline stores	20.58	90%	0.09
Car Fuel (production)	156	Petroleum refineries	71.44	85%	0.32
Restaurant	501	Full-service restaurant	9.69	100%	0.04
Alcohol bev. (*retail margin*)	400	Retail-Food and beverage stores	6.46	90%	0.03
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	12.92	63%	0.06
Bottled water (retail margin)	400	Retail-Food and beverage stores	3.23	90%	0.01
Bottled water (production)	106	Bottled and canned soft drinks & water	6.46	59.50%	0.03
Snacks (retail margin)	400	Retail-Food and beverage stores	3.23	90%	0.01
Snacks (production)	096	Cookies and Cracker manufacturing	6.46	25%	0.03
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	4.89	100%	0.02
Ice (production)	107	Ice (except dry ice)	10.61	100%	0.05
Fish bait	017	Commercial fishing (Bait)	38.74	90%	0.17
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	13.75	90%	0.06
Tackle (production)	385	Fishing tackle and equipment manufacturing	15.31	14%	0.07
Total			223.74		1

Table 2. 12 months trip level expenditures used to compute economic contribution/impact considering resident saltwater anglers.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (retail margin)	402	Retail-Gasoline stores	18.86	100%	0.09
Car Fuel (production)	156	Petroleum refineries	65.47	85%	0.32
Alcohol beverage (*retail margin*)	400	Retail-Food and beverage stores	4.73	100%	0.02
Alcohol bev. (*production*)	108	Breweries (Beer, ale, …)	9.47	63%	0.05
Bottled water (retail margin)	400	Retail-Food and beverage stores	5.92	100%	0.01
Bottled water (production)	106	Bottled and canned soft drinks & water	6.46	59.50%	0.03
Snacks (retail margin)	400	Retail-Food and beverage stores	2.96	100%	0.01
Snacks (production)	096	Cookies and Cracker manufacturing	5.92	25%	0.03
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	5.60	100%	0.03
Ice (production)	107	Ice (except dry ice)	12.15	100%	0.06
Fish bait	017	Commercial fishing (Bait)	35.51	100%	0.17
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	16.80	100%	0.08
Tackle (production)	385	Fishing tackle and equipment manufacturing	18.71	14%	0.09
Total			205.05		1

Table 3. 12 months trip level expenditures used to compute economic contribution/impact considering non-resident saltwater anglers.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (retail margin)	402	Retail-Gasoline stores	1.09	50%	0.08
Car Fuel (production)	156	Petroleum refineries	3.77	45%	0.28
Restaurant meals	501	Full-service restaurants	3.88	100%	0.29
Alcohol bev. (*retail margin*)	400	Retail-Food and beverage stores	0.32	80%	0.02
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	0.65	32%	0.05
Bottled water (retail margin)	400	Retail-Food and beverage stores	0.06	90%	0.005
Bottled water (production)	106	Bottled and canned soft drinks & water	0.13	59.50%	0.01
Snacks (retail margin)	400	Retail-Food and beverage stores	0.10	90%	0.01
Snacks (production)	096	Cookies and Cracker manufacturing	0.19	25%	0.01
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	0.15	100%	0.01
Ice (production)	107	Ice (except dry ice)	0.33	100%	0.02
Fish bait	017	Commercial fishing (Bait)	1.94	90%	0.14
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	0.46	90%	0.03
Tackle (production)	385	Fishing tackle and equipment manufacturing	0.51	14%	0.04
Total			13.59		1

Table 4. 12 months private boat fishing trip expenditures used to compute economic contribution/impact for resident.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (*retail margin*)	402	Retail-Gasoline stores	2.61	100%	0.02
Car Fuel (*production*)	156	Petroleum refineries	9.05	85%	0.07
Boat Fuel (*retail margin*)	402	Retail-Gasoline stores	6.51	100%	0.05
Boat Fuel (*production*)	156	Petroleum refineries	22.62	85%	0.18
Repair and Maintenance	508	Personal and household goods repair and maintenance	19.39	100%	0.16
Insurance	437	Insurance carries, except direct life	19.42	100%	0.16
Alcohol bev. (*retail margin*)	400	Retail-Food and beverage stores	2.16	100%	0.02
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	4.32	63%	0.03
Bottled water (*retail margin*)	400	Retail-Food and beverage stores	1.29	100%	0.01
Bottled water (*production*)	106	Bottled and canned soft drinks & water	2.59	59.50%	0.02
Snacks (*retail margin*)	400	Retail-Food and beverage stores	1.08	100%	0.01
Snacks (*production*)	096	Cookies and Cracker manufacturing	2.16	25%	0.02
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	2.04	100%	0.02
Ice (*production*)	107	Ice (except dry ice) manufacturing	4.43	100%	0.04
Fish bait	017	Commercial fishing (Bait)	12.95	100%	0.10
Tackle (*retail margin*)	404	Retail-Sporting goods, hobby, musical instruments	4.59	100%	0.04
Tackle (*production*)	385	Fishing tackle and equipment manufacturing	5.12	14%	0.04
Total			122.32		1

Table 5. 12 months private boat fishing trip expenditures used to compute economic contribution/impact for non-resident.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (*retail margin*)	402	Retail-Gasoline stores	0.02	50%	0.02
Car Fuel (*production*)	156	Petroleum refineries	0.07	45%	0.06
Boat Fuel (*retail margin*)	402	Retail-Gasoline stores	0.03	50%	0.03
Boat Fuel (*production*)	156	Petroleum refineries	0.11	45%	0.10
Repair and Maintenance	508	Personal and household goods repair and maintenance	0.53	40%	0.46
Insurance	437	Insurance carries, except direct life	0.21	50%	0.18
Alcohol bev. (*retail margin*)	400	Retail-Food and beverage stores	0.01	80%	0.01
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	0.02	32%	0.02
Bottled water (*retail margin*)	400	Retail-Food and beverage stores	0.005	90%	0.004
Bottled water (*production*)	106	Bottled and canned soft drinks & water	0.01	59.50%	0.01
Snacks (*retail margin*)	400	Retail-Food and beverage stores	0.005	90%	0.004
Snacks (*production*)	096	Cookies and Cracker manufacturing	0.01	25%	0.01
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	0.004	100%	0.004
Ice (*production*)	107	Ice (except dry ice) manufacturing	0.01	100%	0.01
Fish bait	017	Commercial fishing (Bait)	0.06	90%	0.05
Tackle (*retail margin*)	404	Retail-Sporting goods, hobby, musical instruments	0.01	90%	0.01
Tackle (*production*)	385	Fishing tackle and equipment manufacturing	0.01	14%	0.01
Total			1.14		1

Table 6. 12 months shore fishing trip-level expenditures used to compute economic contribution/impact for resident anglers.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (retail margin)	402	Retail-Gasoline stores	16.23	100%	0.10
Car Fuel (production)	156	Petroleum refineries	56.35	85%	0.34
Alcohol beverage (*retail margin*)	400	Retail-Food and beverage stores	2.90	100%	0.02
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	5.81	63%	0.04
Bottled water (retail margin)	400	Retail-Food and beverage stores	2.42	100%	0.01
Bottled water (production)	106	Bottled and canned soft drinks & water	4.84	59.50%	0.03
Snacks (retail margin)	400	Retail-Food and beverage stores	4.84	100%	0.03
Snacks (production)	096	Cookies and Cracker manufacturing	9.68	25%	0.06
Ice (*retail margin*)	406	Retail-Miscellaneous store retailers	2.29	100%	0.01
Ice (production)	107	Ice (except dry ice)	4.97	100%	0.03
Fish bait	017	Commercial fishing (Bait)	29.03	100%	0.17
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	13.73	100%	0.08
Tackle (production)	385	Fishing tackle and equipment manufacturing	15.30	14%	0.09
Total			168.39		1

Table 7. 12 months shore fishing trip-level expenditures used to compute economic contribution/impact for non-resident anglers.

Item	IMPLAN© Sector Code	IMPLAN© Sector Description	Expense ($million)	Percent local	Expense Share
Car Fuel (retail margin)	402	Retail-Gasoline stores	1.70	50%	0.08
Car Fuel (production)	156	Petroleum refineries	5.90	45%	0.27
Restaurant meals	501	Full-service restaurants	9.50	100%	0.43
Alcohol beverage (*retail margin*)	400	Retail-Food and beverage stores	0.32	80%	0.01
Alcohol beverage (*production*)	108	Breweries (Beer, ale, …)	0.63	32%	0.03
Snacks (retail margin)	400	Retail-Food and beverage stores	0.13	90%	0.01
Snacks (production)	96	Cookies and Cracker manufacturing	0.25	25%	0.01
Fish bait	017	Commercial fishing (Bait)	1.90	90%	0.09
Tackle (retail margin)	404	Retail-Sporting goods, hobby, musical instruments	0.90	90%	0.04
Tackle (production)	385	Fishing tackle and equipment manufacturing	1.00	14%	0.05
Total			22.23		1

RESULTS

Demographics

Presented in Table 8 are summary statistics on age, race, sex, marital status, household type, education, and income. The survey data shows that the average saltwater angler is about 54 years old (median is 55). Plurality of the anglers are white (91.7%), male (88.6%), married (85%), live in a family household (92.9%), have a bachelor's degree (31.5%), and have annual household income of $150, 0000 or more (25.2%). These results exhibit a degree of similarity to those reported by Knowlton in 2018, where most (87%) saltwater anglers in Georgia were of Caucasian ethnicity. In contrast, African Americans constituted only 5%, and Hispanics/Latinos represented 3%. Knowlton's study also highlighted that most anglers, 26%, held bachelor's degrees, and 24% had incomes of $120,000 or higher. Additionally, the median age of anglers in her research was reported to be 49 years old.

Table 8. Summary statistics on demographics

Variable	Obs.	%	Mean	Median
Age	254		54.32	55
Race				
White	231	91.67		
Black or African American	8	3.17		
Hispanic	5	1.98		
Asian	2	0.79		
Other (Mixed)	6	2.38		
Sex				
Male	225	88.58		
Female	29	11.42		
Marital Status				
Married	216	85.04		
Divorced	18	7.09		
Never married	15	5.91		
Widowed	3	1.18		
Separated	2	0.79		
Household type				
Family household	235	92.89		
Non-family household	18	7.11		
Education				
Bachelor's degree	79	31.47		
High school diploma	75	29.88		
Associate degree	36	14.34		
Master's degree	29	11.55		
PhD/ Doctorate degree	14	5.59		
Professional degree	13	5.18		
No High school diploma	5	1.99		
Income				
$150, 000 or more	61	25.21		
$100,000 - $124,999	36	14.88		
$60,000 - $79,999	31	12.81		
$125,000 - $149,999	30	12.40		
$80,000 - $99,999	29	11.98		
$40,000 - $59,999	29	11.98		
$20,000 - $39,999	19	7.85		
Less than $20,000	7	2.89		

Background on saltwater recreational fishing

This includes the method of fishing used in the last saltwater fishing trip, the marine zone where the fishing activity occurred, the county where respondents either fished from or set out in boats for fishing, the fish species targeted, the number of fish that respondents need to catch to feel the

trip was successful, respondents source of fishing-related information, and number of saltwater fishing trips taken within a year.

Figure 2 depicts the fishing method used in the last fishing trip. The top three fishing methods are private boat fishing (50%), shore fishing (42%), and charter boat fishing (5.3%).

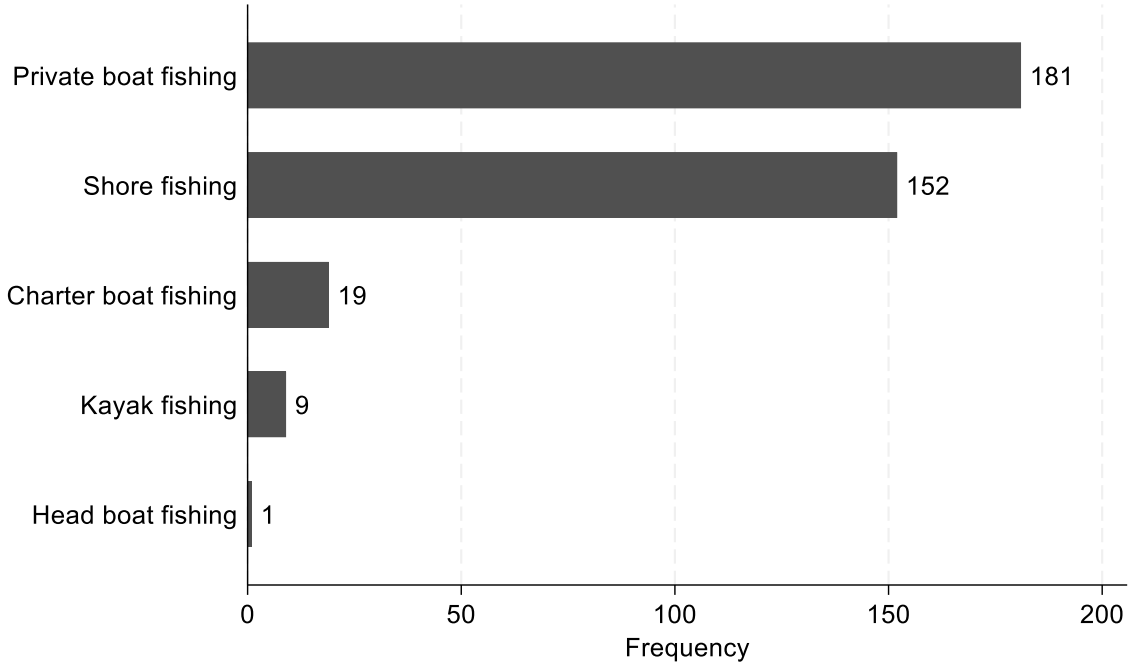

Figure 2. Fishing method used in the last saltwater fishing trip.

Displayed in Figure 3 is the marine zone where anglers indicated they fished. A plurality (73.7%) of responding anglers indicated they fished inshore during their last saltwater fishing trip while 20% fished nearshore. Only 6.3% fished offshore. By regulation inshore is up to about 2.5 nautical miles from the shoreline. This is within state waters, which is about 3 nautical miles from the shoreline. Nearshore is between 2.5 and 15 nautical miles, and offshore is beyond 15 nautical miles. This finding aligns with those of Responsive Management (2022). They note that 86% of Georgia saltwater anglers fish inshore, 57% fish in nearshore waters, and 26% in offshore waters.

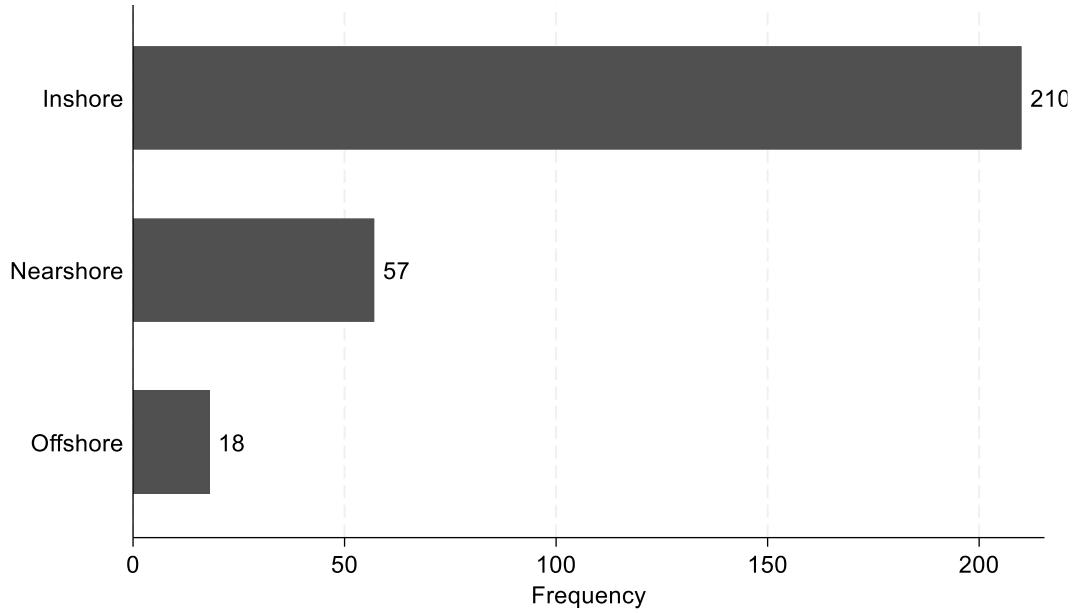

Figure 3. Marine zone where anglers fished from during the last saltwater fishing trip

In terms of the counties where anglers either fished from or set out in vessels for fishing, Figure 4 illustrates that the leading three counties were Glynn County (29.9%), Chatham County (25.5%), and Camden County (16.2%).

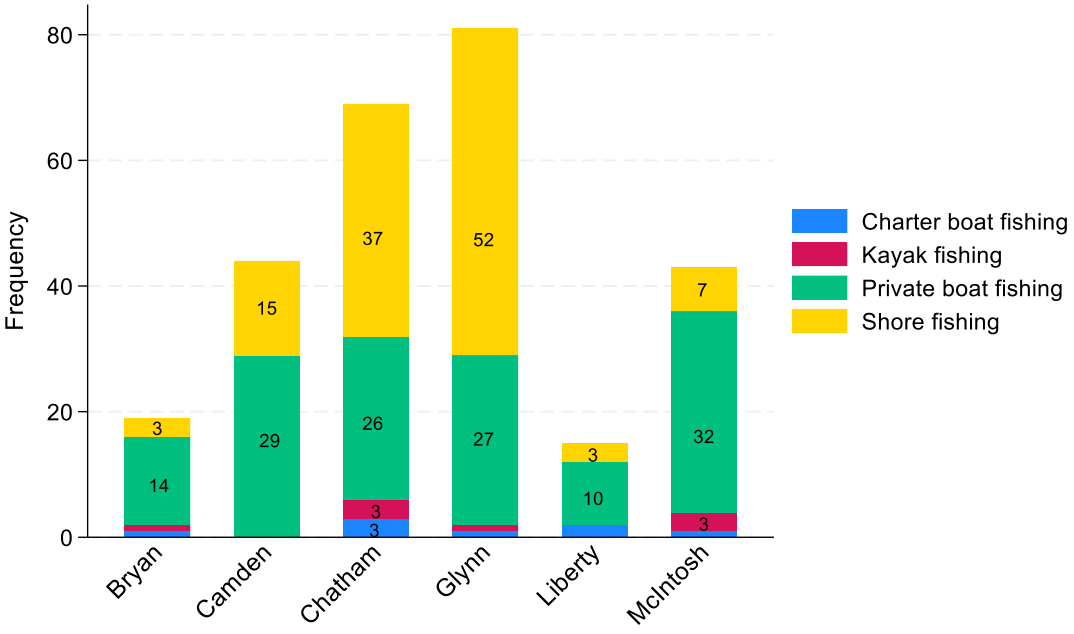

Figure 4. County where anglers chose to fish or departed in vessels to go fishing.

Furthermore, upon examining the data on anglers' fishing methods and their choice of county, it becomes apparent that most (52) of the surveyed anglers who fished in Glynn County engaged in shore fishing (see Figure 4). Conversely, most of the respondents (32) who selected private boat fishing did so in McIntosh County. It's worth noting that Chatham County stood out as a prominent destination for charter boat fishing.

When inquired about their preferences for the counties to engage in fishing or embark on a boat trip for their next saltwater fishing trip, Glynn, Chatham, and Camden County continued to be the foremost choices (Figure 5). Responsive Management (2022) also finds that Glynn and Chatham Counties are the top tier saltwater fishing sites in Georgia.

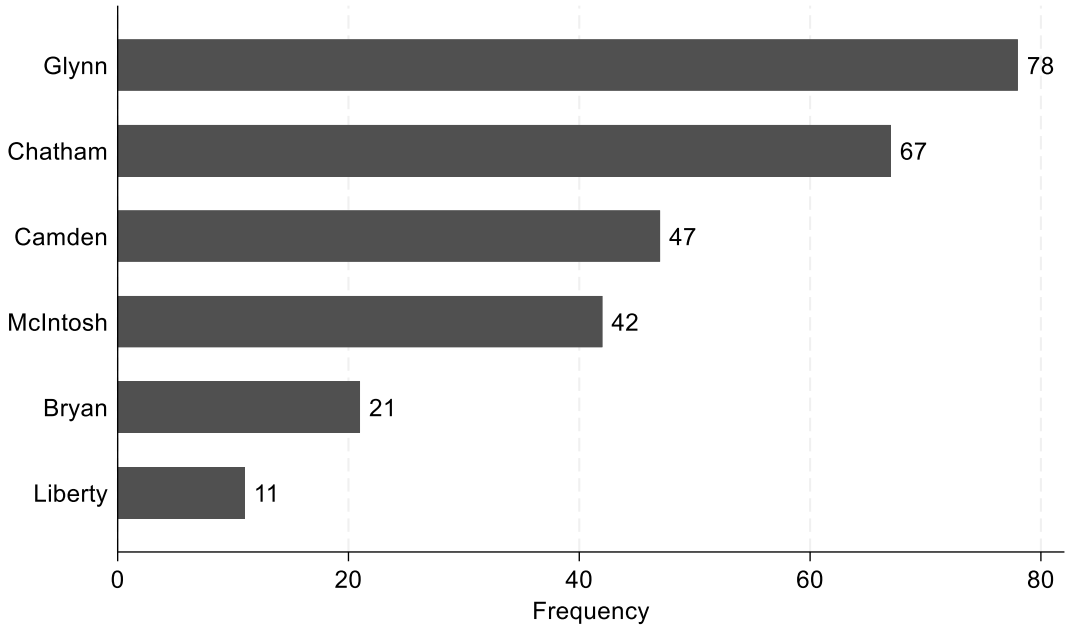

Figure 5. County where anglers plan to fish from or departed in a boat to go fishing during their next trip.

When asked about the elements influencing saltwater anglers' selection of fishing locations, the foremost considerations that surfaced were weather conditions, prior fishing achievements at the site, and the quality of the water (refer to Figure 6). This largely holds true irrespective of the method employed by anglers for saltwater fishing. These results underscore the potential ramifications of climate change on outdoor leisure activities and the tourism industry in Georgia.

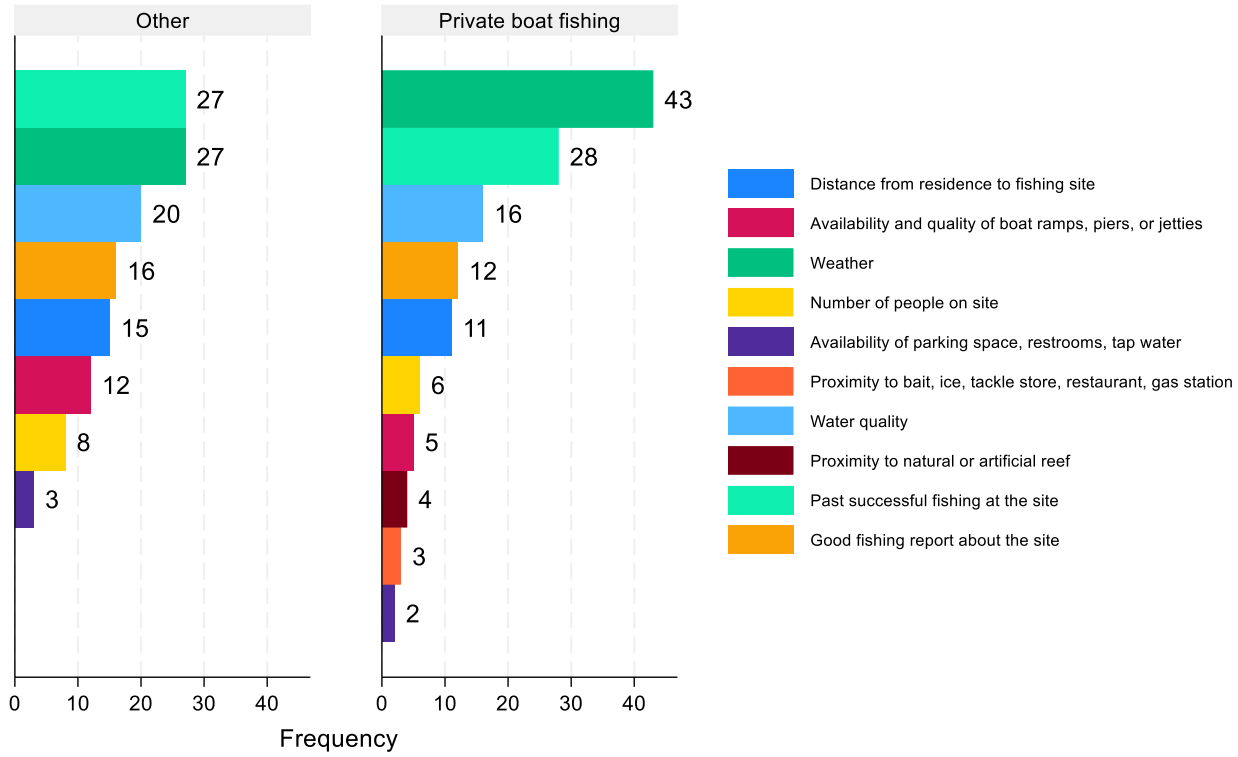

Figure 6. Factors affecting choice of fishing site

Figure 7 presents anglers' targeted fish species. The survey data suggest that seatrout, red drum, flounder, sheepshead, and whiting are the top five fish species targeted by saltwater recreational anglers in Georgia. Black drum, Atlantic croaker, sea bass, shark, and red snapper are other popular targeted species. “Other species” include, blue crab, shrimp, oyster, etc. Responsive Management (2022) also note that seatrout, red drum, flounder, and sheepshead are typically sought-after saltwater fish species by anglers in Georgia.

Respondents were also asked about the quantity of fish species they must catch to consider their trip a success. As depicted in Table 9, the responses generally fall within the daily and possession limits. For instance, for seatrout, the average number reported was approximately 6, with a median of 5. By regulations the daily and possession limit for seatrout is 15 (DNR CRD 2023).

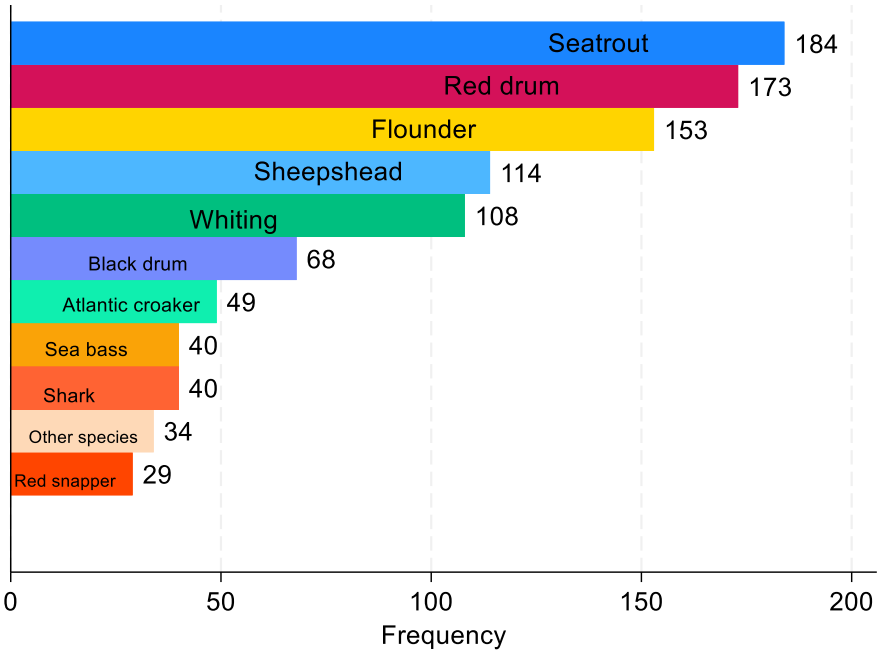

Figure 7. Target fish species

Table 9. Quantity of fish to catch to feel fishing trip was successful

Fish species	Obs	Mean	Median	Min	Max.
Seatrout	179	6.25	5	0	50
Red drum	169	3.31	2	0	25
Whiting	105	10.16	7	0	50
Flounder	152	3.32	2	0	40
Red snapper	26	2.92	2	0	10
Sheepshead	38	1.97	1	0	10
Tarpon	110	4.42	3	0	20
Atlantic croaker	49	10.94	8	0	100
Black sea bass	37	7.32	5	0	28
Black drum	65	3.09	2	0	25

Regarding source of fishing-related information, Figure 8 shows that plurality of anglers (46.3%) rely on the internet for fishing-related information. Friends and family (32%), Tackle shopes (10%) and Marinas (7%) are alternative sources of saltwater recreational fishing-related information. Georgia Department of Natural Resources, guides, personal experience, magzines were other sources mentioned.

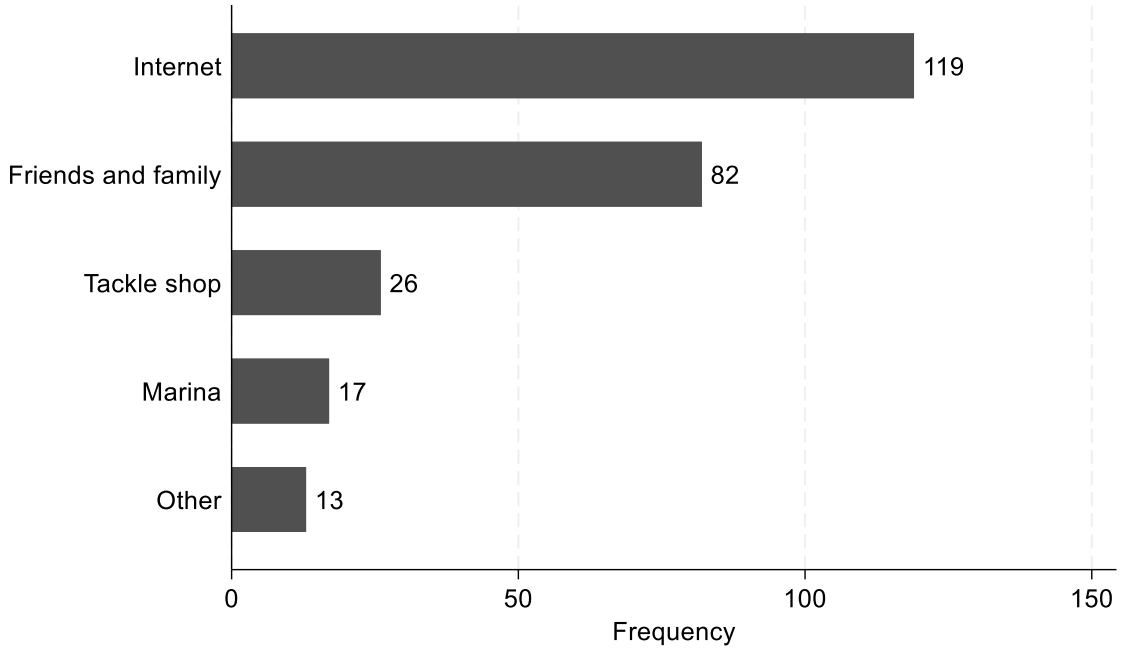

Figure 8. Source of fishing-related information

Table 10 provides a summary of annual saltwater recreational fishing trips categorized by fishing method and resident status. When it comes to Georgia residents, the typical saltwater angler who engages in shore fishing embarks on approximately 23 fishing trips each year. For those who prefer private boat fishing, the average is around 20 trips, while charter boat fishing sees about 4 outings per year. Head boat fishing averages 7 trips annually, kayak fishing stands at 27 trips in a year. In contrast, non-resident saltwater anglers have somewhat different patterns. A typical non-resident saltwater angler participating in shore fishing embarks on approximately 17 fishing trips annually. For those who opt for private boat fishing, the average is approximately 12 trips, while charter boat fishing comprises around 2 outings per year. Kayak fishing averages 24 trips annually.

Table 10. Annual saltwater recreational fishing trips by fishing method and resident type**.**

	Obs.	Mean	Median	Min.	Max.
Georgia residents					
Shore fishing	86	23.48	5	1	240
Private boat fishing	88	19.84	10	1	120
Charter boat fishing	22	3.55	1	1	48
Head boat fishing	4	7.25	4	1	20
Kayak fishing	17	27.35	7	1	288
Non-residents					
Shore fishing	43	17.16	3	1	240
Private boat fishing	36	12.44	4	1	80
Charter boat fishing	10	2.1	1	1	6
Head boat fishing	0	0	0	0	0
Kayak fishing	6	24.33	9.5	1	72

Saltwater recreational fishing expenditure

The initial focus is on all anglers sampled, encompassing both residents and non-residents. Subsequently, the expenses are divided into categories for residents and non-residents, and further stratified by private boat and shore fishing, considering both resident and non-resident anglers. Charter and head boat fishing expenditures are combined for analysis.

When considering both residents and non-residents, saltwater recreational anglers spent an average of $594.82 per trip on trip-related costs in 2022, with a median expenditure of $187. This estimate closely resembles the 2016 national estimate of $739, as reported by the US Fish and Wildlife Service in 2016. The top five expenditure categories as shown in Table 11 were as follows: lodging, with an average of $194.80 (median of $0), restaurant meals at $100.90 (median of $5), car fuel at $96.14 (median of $47.5), tackle at $66.30 (median of $15), and boat fuel at $63.90 (median of $0).

Table 11. Trip-level expenditures.

Item	Obs.	Mean ($)	Median ($)	Min. ($)	Max. ($)	Std. dev. ($)
Car fuel	288	96.14	47.5	0	3800	258.14
Car rental	287	12.49	0	0	1200	84.68
Boat fuel	287	63.89	0	0	3000	255.51
Boat rental	287	0.42	0	0	120	7.08
Airplane ticket	287	11.76	0	0	650	73.16
Train ticket	287	0	0	0	0	0
Taxi service	287	0	0	0	0	0
Bus ticket	287	0.32	0	0	90	5.313
Lodging	287	194.77	0	0	4500	537.64
Campgrounds	287	30.44	0	0	3600	222.80
Restaurant	287	100.90	5	0	1500	178.07
Alcohol and Soda	287	27.89	10	0	500	51.49
Bottled water	287	12.12	5	0	500	33.23
Snacks	287	8.53	5	0	100	15.39
Ice	287	16.87	8	0	200	27.51
Charter fishing fee	287	44.20	0	0	1400	164.12
Head boat fishing fee	287	11.23	0	0	1200	97.74
Fishing tournament fee	287	4.28	0	0	999	59.77
Fish bait	287	37.29	20	0	1500	106.00
Tackle	287	66.30	15	0	1500	184.27
Gift/Souvenirs	287	9.29	0	0	400	38.28
Other	287	4.95	0	0	750	48.85

Narrowing our attention to Georgia residents exclusively, in 2022, Georgia resident saltwater recreational anglers had an average expenditure of $565.1 per trip on trip-related expenses, with a median expenditure of $250.[2] Table 12 reveals that the primary categories of expenditure included lodging, which averaged $127.98 (with a median of $0), followed by restaurant meals at $77.20 (with a median of $0), car fuel at $68.05 (with a median of $47.5), tackle at $67.33 (with a median of $20), and boat fuel at $50.88 (with a median of $0).

[2] Saltwater anglers living in the coastal areas of Georgia, specifically in the 11 designated coastal counties (Effingham, Chatham, Bryan, Liberty, Long, McIntosh, Wayne, Glynn, Brantley, Camden, and Charlton), had an average spending of $273.8 on expenses related their fishing trips, with a median expenditure of $170.

Table 12. Georgia residents' trip-level expenditures.

Item	Mean ($)	Median ($)	Min. ($)	Max. ($)	Std. dev. ($)
Car fuel	68.05	47.5	0	600	94.13
Car rental	3.10	0	0	100	14.38
Boat fuel	50.88	0	0	1000	129.1
Boat rental	0	0	0	0	0
Airplane ticket	2.39	0	0	400	30.95
Train ticket	0	0	0	0	0
Taxi service	0	0	0	0	0
Bus ticket	0.01	0	0	1	0
Lodging	127.98	0	0	2000	325.85
Campgrounds	13.16	0	0	400	54.92
Restaurant	77.20	0	0	800	139.47
Alcohol and Soda	28.12	8	0	500	57.45
Bottled water	11.132	5	0	100	14.22
Snacks	8.88	5	0	100	25.2
Ice	17.14	10	0	200	14.44
Charter fishing fee	35.62	0	0	1400	150.68
Head boat fishing fee	16.21	0	0	1200	78.1
Fishing tournament fee	6.84	0	0	999	122.09
Fish bait	29.16	20	0	200	33.81
Tackle	67.33	20	0	1500	175.44
Gift/Souvenirs	9.91	0	0	400	45.99
Other	3.10	0	0	250	24.91

Note: Number of observations for each item is 168.

Shifting our focus to non-resident anglers, in 2022, non-resident saltwater recreational anglers had an average expenditure of $1,133.77 per angler day on trip-related costs, with a median expenditure of $540. Table 13 shows that the top five categories of expenses included lodging, averaging $362.05 (with a median of $0), followed by car fuel at $165.54 (with a median of $50), restaurant meals at $161.43 (with a median of $40), boat fuel at $69.19 (with a median of $0), and tackle at $67.42 (with a median of $10).

Table 13. Non-residents' day trip-level expenditures.

Item	Obs.	Mean	Median	Min.	Max.	Std. dev.
Car fuel	83	165.54	50	0	3,800	450.58
Car rental	83	14.64	0	0	500	75.34
Boat fuel	83	69.19	0	0	2,600	292.66
Boat rental	83	1.45	0	0	120	13.09
Airplane ticket	83	27.11	0	0	650	113.13
Train ticket	83	0	0	0	0	0
Taxi service	83	0	0	0	0	0
Bus ticket	83	0	0	0	0	0
Lodging	83	362.05	0	0	4,500	840.13
Campgrounds	83	67.65	0	0	3,600	400
Restaurant	83	161.43	40	0	1,500	246.2
Alcohol and Soda	83	30.15	10	0	250	46.11
Bottled water	83	16.28	2	0	500	57.79
Snacks	83	9.06	3	0	100	34.12
Ice	83	17.57	5	0	200	19.35
Charter fishing fee	83	64.76	0	0	1,200	204.15
Head boat fee	83	6.02	0	0	500	54.56
Fishing tournament fee	83	0	0	0	0	0
Fish bait	83	54.45	20	0	1,500	185.78
Tackle	83	67.42	10	0	1,500	207.02
Gift/Souvenirs	83	6.08	0	0	100	20.33
Other	83	10.84	0	0	750	83.26

Note: Number of observations for each item is 83.

When examining private boat trips among resident saltwater recreational anglers, the survey data suggests that these anglers spent an average of $474.79 per angler day on trip-related expenses in 2022, with a median expenditure of $210.[3] It's worth noting that this estimate surpasses the figure reported by Lovel et al. in 2020, which was based on both residents and non-residents and amounted to $40.58. Table 14 illustrates that the five primary categories of trip-level expenditures for private boat anglers in 2023 were boat fuel at $95.37 (with a median of $45), tackle at $72.71 (with a median of $15), restaurant meals at $59.06 (with a median of $0), lodging at $58.33 (with a median of $0), and car fuel at $57.53 (with a median of $30). In

[3] Anglers residing in Georgia coastal counties, who utilized private boats for their fishing trips, had an average expenditure of $312.5 per fishing trip (with a median spending of $181).

contrast, Lovel et al. (2020) identified boat fuel ($13.21), auto fuel ($9.30), and groceries ($6.43) as the top three expenses associated with boat trips in 2017. Additional expenditures for private boat anglers in 2022 included monthly boat insurance at $43.19 (with a median of $25), monthly boat storage at $65.63 (with a median of $0), annual boat repairs at $782.83 (with a median of $299.50), and annual boat registration at $54.86 (with a median of $36.50).

Table 14. Private boat expenditures for Georgia residents

Item	Obs.	Mean	Median	Min.	Max.	Std. dev.
Trip-level expenditures						
Car fuel	87	57.53	30	0	500	72.94
Car rental	87	1.03	0	0	65	7.44
Boat fuel	87	95.37	45	0	1,000	165.32
Boat rental	87	0	0	0	0	0
Airplane ticket	87	0	0	0	0	0
Train ticket	87	0	0	0	0	0
Taxi service	87	0	0	0	0	0
Bus ticket	87	0	0	0	0	0
Lodging	87	58.33	0	0	1,500	192.57
Campgrounds	87	5.98	0	0	300	38.47
Restaurant	87	59.06	0	0	800	130.42
Alcohol and Soda	87	18.74	10	0	200	31.37
Bottled water	87	11.15	6	0	50	12.59
Snacks	87	8.05	5	0	100	12.57
Ice	87	16.46	10	0	200	27.19
Fishing tournament fee	87	19.83	0	0	1,200	131.47
Fish bait	87	30.38	20	0	200	34.44
Tackle	87	72.71	15	0	1,500	208.61
Gift/Souvenirs	87	4.71	0	0	300	33.79
Other	87	0.23	0	0	20	2.14
Other expenditures						
Boat insurance (monthly)	78	43.19	25	0	300	59.08
Boat storage (monthly)	85	65.63	0	0	951	173.90
Boat repairs (annually)	66	782.83	299.50	299.50	2,749.50	691.28
Boat registration (annually)	80	54.86	36.50	0	300	52.33

Table 15 reveals that non-resident private boat anglers spent an average of $908.21 per angler day on trip-related costs in 2022, with a median expenditure of $245.The primary categories of trip-level expenditures for non-resident private boat anglers in 2022 included car fuel at $154.21 (with a median of $30), boat fuel at $147.26 (with a median of $50), restaurant

meals at $141.41 (with a median of $0), campground fees at $101.28 (with a median of $0), and lodging at $71.79 (with a median of $0). In addition, other relevant expenses encompassed monthly boat insurance at $43.94 (with a median of $25), monthly boat storage at $98.74 (with a median of $0), annual boat repairs at $864.88 (with a median of $749.50), and annual boat registration at $68 (with a median of $34).

Table 15. Private boat expenditures for non-residents

Item	Obs.	Mean	Median	Min.	Max.	Std. dev.
Car fuel	39	154.21	30	0	3,800	603.08
Car rental	39	0	0	0	0	0
Boat fuel	39	147.26	50	0	2,600	418.51
Boat rental	39	3.08	0	0	120	19.22
Airplane ticket	39	42.31	0	0	650	149.80
Train ticket	39	0	0	0	0	0
Taxi service	39	0	0	0	0	0
Bus ticket	39	0	0	0	0	0
Lodging	39	71.79	0	0	1,800	299.96
Campgrounds	39	101.28	0	0	3,600	576.11
Restaurant	39	141.41	0	0	1,500	296.40
Alcohol and Soda	39	21.82	10	0	100	28
Bottled water	39	23.67	5	0	500	80.43
Snacks	39	8.00	5	0	100	16.41
Ice	39	18.03	5	0	200	39.20
Fishing tournament fee	39	12.82	0	0	500	80.06
Fish bait	39	71.74	20	0	1,500	240.02
Tackle	39	62.59	10	0	1,500	242.01
Gift/Souvenirs	39	3.21	0	0	100	16.40
Other	39	3.85	0	0	150	24.02
Other expenditures						
Boat insurance (monthly)	33	43.94	25.00	0	$300	63.13
Boat storage (monthly)	38	98.74	0	0	$800.50	187.11
Boat repairs (annually)	26	864.88	749.50	299.50	$2,749.50	597.62
Boat registration (annually)	32	68	34	0	$450	105.34

Focusing on shore fishing method, which includes fishing from the shoreline/bank, beach, bridge, dock, pier, jetties, etc., in 2022, Georgia residents who engaged in saltwater fishing through shore fishing spent an average of $622.08 per day per angler. The median

expenditure stood at $116.[4] Table 16 shows that the primary expenditure categories for residents engaging in shore fishing in 2023 included accommodations, where the average cost was $211.63 (with a median of $0), followed by restaurant meals at an average of $97.62 (with a median of $0), car fuel at $82.93 (with a median of $50), tackle expenses at $58.89 (with a median of $20), and finally, expenditures on alcohol and soda at an average of $40.20 (with a median of $6).

Table 16. Shore fishing trip expenditures for Georgi residents

Item	Mean ($)	Median ($)	Min. ($)	Max. ($)	Std. dev. ($)
Car fuel	82.93	50	0	60	116.74
Car rental	6.06	0	0	100	20.18
Boat fuel	3.52	0	0	250	29.67
Boat rental	0	0	0	0	0
Airplane ticket	5.65	0	0	400	47.47
Train ticket	0	0	0	0	0
Taxi service	0	0	0	0	0
Bus ticket	0	0	0	0	0
Lodging	211.63	0	0	2,000	418.30
Campgrounds	23.82	0	0	400	71.64
Restaurant	97.62	0	0	600	146.25
Alcohol and Soda	40.20	6	0	500	78.35
Bottled water	11.03	5	0	100	16.29
Snacks	17.66	10	0	100	23.75
Ice	10.32	5	0	100	17.13
Charter fishing fee	0	0	0	0	0
Head boat fishing fee	0	0	0	0	0
Fishing tournament fee	0	0	0	0	0
Fish bait	28.04	20	0	200	31.11
Tackle	58.89	20	0	1,000	134.24
Gift/Souvenirs	17.68	0	0	400	59.20
Other	7.04	0	0	250	37.92

Note: Number of observations for each item is 71.

[4] Anglers residing in Georgia coastal counties, who utilized shore fishing method, had an average expenditure of $172.67 per trip (median is $117).

The average expenditure for nonresident anglers who chose shore fishing amounted to $1,267.62, and the median expenditure was $234. As indicated in Table 17, the top five categories of expenses for these nonresident anglers encompass lodging, car fuel, restaurant meals, tackle, and fish bait. Specifically, the expenses for lodging averaged $600 (with a median of $0), car fuel stood at an average of $166.30 (with a median of $80), restaurant meals averaged $162 (with a median of $100), tackle expenses came in at an average of $84.46 (with a median of $20), and fish bait costs were around $47.59 (with a median of $20).

Table 17. Shore fishing trip expenditures for non-residents

Item	Mean ($)	Median ($)	Min. ($)	Max. ($)	Std. dev. ($)
Car fuel	166.30	80	0	1,200	263.67
Car rental	32.84	0	0	500	111.66
Boat fuel	0	0	0	0	0
Boat rental	0	0	0	0	0
Airplane ticket	16.22	0	0	400	72.70
Train ticket	0	0	0	0	0
Taxi service	0	0	0	0	0
Bus ticket	0	0	0	0	0
Lodging	600	0	0	4,500	1,126.94
Campgrounds	45	0	0	500	125.30
Restaurant	162	100	0	500	178.96
Alcohol and Soda	36.92	10	0	200	49.74
Bottled water	12.59	0	0	150	27.32
Snacks	21.62	4	0	100	31.62
Ice	11.95	0	0	100	23.55
Charter fishing fee	0	0	0	0	0
Head boat fishing fee	0	0	0	0	0
Fishing tournament fee	0	0	0	0	0
Fish bait	47.59	20	0	800	133.39
Tackle	84.46	20	0	1,000	188.45
Gift/Souvenirs	9.86	0	0	100	25.21
Other	20.27	0	0	750	123.30

Note: Number of observations for each item is 37.

Economic impact results

As mentioned previously, money spent on saltwater recreational fishing circulates through Georgia's economy, leading to a multiplier effect where one dollar spent can have a more

significant impact as it passes through various sectors. The economic impacts are represented by employment, labor income, value-added and output. Employment represents the number of full-time and part-time jobs created by a sector. Labor income comprises all forms of employment income, including employee compensation and proprietor income. Value-added is the difference between a sector's total output and the cost of its intermediate inputs. Output is the total dollar value of production or service by a sector for a given period (Parajuli et al., 2018; Jolley et al., 2020). The discussions will focus on the total effects. All economic impact estimates are reported in 2023-dollar values.

Table 18 reports the economic impact for both resident and non-resident saltwater recreational fishing in Georgia. The results show that saltwater recreational fishing trips in Georgia supported 3,217 full or part-time jobs, contributed $310.6 million in sales, $74.4 million in labor income, and $155.1 million in gross domestic product (GDP) to Georgi's economy. The current estimates are slightly higher than what Lovel et al. (2020) found in 20217. They estimated that in 2017 saltwater recreational fishing trips in Georgia supported 2,788 full or part-time jobs, contributed $230.52 million in sales, $75.6 million in labor income, and $144.4 million in gross domestic product (GDP).

Table 18. Economic impacts of saltwater recreational fishing

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	2,566	39.12	93.17	197.74
Indirect Effect	348	20.77	34.41	66.92
Induced Effect	302	14.47	27.48	45.91
Total Effect	3,217	74.37	155.07	310.57
Imputed Multiplier	1.3	1.9	1.7	1.6

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 19 shows that Georgia resident saltwater recreational fishing trips supported 3,039 full or part-time jobs, contributed $292.90 million in sales, $71.3 million in labor income, and $148.3 million in gross domestic product (GDP) to Georgi's economy. These estimates are higher than what Lovel et al. (2020) found in 20217. They estimated that in 2017 saltwater recreational fishing trips in Georgia supported 2,788 full or part-time jobs, contributed $230.5 million in sales, $75.6 million in labor income, and $144.4 million in gross domestic product (GDP).

Table 19. Residents' saltwater recreational fishing economic impacts

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	2,419	37.78	89.27	185.83
Indirect Effect	331	19.62	32.67	63.08
Induced Effect	290	13.87	26.34	43.99
Total Effect	3,039	71.27	148.28	292.90
Imputed Multiplier	1.3	1.9	1.7	1.6

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 20 indicates that non-resident saltwater recreational fishing trips supported 214 full or part-time jobs, contributed $17 million in sales, $5.1 million in labor income, and $9.2 million in gross domestic product (GDP) to Georgi's economy.

Table 20. Non-residents' economic impacts of saltwater recreational fishing

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	175	3.0	5.5	10.3
Indirect Effect	18	1.1	1.9	3.5
Induced Effect	21	1.0	1.9	3.2
Total Effect	214	5.1	9.2	17.0
Imputed Multiplier	1.2	1.7	1.7	1.6

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 21 indicates that resident private boat trips supported 1,672 full or part-time jobs, contributed $198.9 million in sales, $53.6 million in labor income, and $101.8 million in gross domestic product (GDP) to Georgi's economy. Lovel et al. (2020) estimated that in 2017 private boat trips in Georgia supported 769 full or part-time jobs, contributed $56.7 million in sales, $18.2 million in labor income, and $37.4 million in gross domestic product (GDP). Estimates by Lovel et al. (2020) might have combined resident and non-resident private boat anglers.

Table 21. Economic impacts of saltwater recreational fishing using private boat; residents

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	1,209	27.7	57.4	119.3
Indirect Effect	246	15.5	24.6	46.6
Induced Effect	217	10.4	19.8	33.0
Total Effect	1,672	53.6	101.8	198.9
Imputed Multiplier	1.4	1.9	1.8	1.7

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 22 suggests that in 2022 non-resident private boat trips supported 9 full or part-time jobs, contributed $1 million in sales, $0.3 million in labor income, and $0.5 million in gross domestic product (GDP) to Georgi's economy.

Table 22. Economic impacts of saltwater recreational fishing using private boat; for non-residents

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	6	0.2	0.3	0.6
Indirect Effect	1	0.1	0.1	0.2
Induced Effect	1	0.1	0.1	0.2
Total Effect	9	0.3	0.5	1.0
Imputed Multiplier	1.4	1.9	1.8	1.7

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 23 indicates that in 2022, Georgia resident shore fishing outings played a role in sustaining 2,340.7 jobs, generating $232.6 million in sales, providing $53.4 million in labor income, and contributing $116.6 million to Georgia's gross domestic product (GDP).

Table 23. Economic impacts of saltwater recreational fishing using shore fishing method; residents

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	1,865	27.6	72.2	150.6
Indirect Effect	259	15.4	24.7	49.1
Induced Effect	217	10.4	19.7	33.0
Total Effect	2,341	53.4	116.6	232.6
Imputed Multiplier	1.3	1.9	1.6	1.5

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

Table 24 indicates that non-resident shore fishing trips contributed to the sustenance of 362 full or part-time jobs, injected $29.8 million into sales, provided $9.7 million in labor income, and added $15.9 million to Georgia's gross domestic product (GDP).

Table 24. Economic impacts of saltwater recreational fishing using shore fishing method; non-residents

Impact type	Employment	Labor Income	Value Added	Output
Direct Effect	290	5.8	8.9	17.6
Indirect Effect	32.	2.0	3.4	6.2
Induced Effect	40	1.9	3.6	6.0
Total Effect	362	9.7	15.9	29.8
Imputed Multiplier	1.2	1.7	1.8	1.7

Note: Except for employment and imputed multiplier, values are in millions ($1000,000) of dollars.

DISCUSSION AND CONCLUSION

This project documents the demographics and economic significance of saltwater recreational fishing in Georgia, shedding light on key findings derived from surveys conducted among both residents and nonresident saltwater anglers.

The result of the survey suggests saltwater recreational fishing is dominated by middle-aged white men with at least bachelor's degree and a household annual income exceeding $80, 000. The survey also reveals that saltwater recreational fishing is somewhat expensive, with an average expenditure of $594.82 (median is $187) per trip per angler. This estimate closely aligns with the national average reported in 2016 by the US Fish and Wildlife Service, which was $739. The top expenditure categories encompass lodging, restaurant expenses, auto fuel, tackle, and boat fuel. However, the expenditure patterns vary depending on whether the angler is a resident or nonresident, reside in a Georgia coastal county, as well as their chosen method of fishing. In terms residence, Georgia resident saltwater anglers spend an average of $564.88 (median is $247.5) per trip while nonresidents spend $1, 133.8 (median is $540) per trip. In contrast, saltwater anglers residing in Coastal Georgia tend to have lower expenditures. The average spending for this group of residents amounts to $273.8, and the median expenditure is $170. These differences can be attributed to various factors, including travel expenses incurred by nonresidents coming from distant locations. Furthermore, the method of fishing also plays a pivotal role in expenditure. For example, anglers who use private boats tend to have additional costs like boat fuel and insurance, contributing to the disparity in spending.

The economic contributions of angler expenditure are substantial. Saltwater recreational fishing trips supported 3,039 full or part-time jobs, contributed $292.90 million in sales, $71.3 million in labor income, and $148.3 million in gross domestic product (GDP) to Georgi's

economy. As expected, these estimates, to a large extent, are higher than what Lovel et al. (2020) found in 20217. They estimated that in 2017 saltwater recreational fishing trips in Georgia supported 2,788 full or part-time jobs, contributed $230.5 million in sales, $75.6 million in labor income, and $144.4 million in gross domestic product (GDP).

The research also unveiled that well-frequented locations for saltwater recreational fishing include Glynn County, Chatham County, and Camden County. This revelation is not unexpected, as these counties are renowned tourist destinations along Georgia's coastline, offering various amenities that enhance the appeal of saltwater recreational fishing. The survey results indicated that most respondents consider several factors when choosing their fishing destination. These factors encompass the proximity of the destination to their residence, past fishing success at the site, the availability of amenities such as parking, restroom facilities, tap water, proximity to bait, ice, tackle stores, restaurants, gas stations, weather conditions, and water quality. Additionally, the top three fish species sought after by anglers are seatrout, red drum, and flounder.

In summary, the economic significance of saltwater recreational fishing in Georgia cannot be overstated. The findings of this study demonstrate its substantial contributions to the state's economy, including job creation, sales revenue, labor income, and GDP. Compared to previous estimates in 2017, the sector has shown growth, supporting more jobs and contributing more to the state's economic well-being. Variations in economic contributions are to be expected, given the diverse nature of saltwater recreational fishing. Different resident types and fishing methods naturally lead to differences in spending patterns. The selection of weather conditions and water quality as primary factors affecting saltwater anglers' choice of fishing locations highlights the potential ramifications of climate change on outdoor leisure activities and the tourism industry in Georgia. Popular fishing destinations in Glynn County, Chatham County, and Camden County provide valuable insights for marketing and infrastructure development.

Georgia’s saltwater recreational fishing sector intertwines with various industries, from retail and manufacturing to hospitality and tourism. It generates government revenue through taxes and fees while also contributing to conservation efforts. The intricate web of economic and ecological interdependencies underscores the importance of sustainable practices and effective management to ensure the continued prosperity of saltwater recreational fishing in Georgia.

The limitations of this report should be considered when interpreting its findings. Firstly, the study relied on self-reported data, which introduces the potential for response bias and inaccuracies in participants' recollections. Self-reported data can be influenced by subjective perceptions and may not always reflect objective reality. Additionally, the primary mode of data collection via the internet might have introduced a form of self-selection bias, as individuals with greater technological proficiency were more inclined to participate in the survey, potentially influencing the outcomes. Moreover, the study's limited survey completion rate poses a constraint on the ability to extend the findings to a wider population of saltwater anglers. Subsequent research endeavors should aim for a larger and more diverse sample size that encompasses various saltwater recreational fishing practices, possibly implementing incentives to enhance survey participation rates.

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APPENDIX

Survey Instrument

Screening questions

Q1. Are you 18 years or older?

- ○ Yes
- ○ No

Q2. Have you participated in saltwater recreational fishing in Georgia in the previous 12 months?

- ○ Yes
- ○ No

Saltwater recreational fishing experience

Q3. Which of the following best characterizes your last saltwater fishing trip? *Check one:*

- ○ Shore fishing (shoreline/bank, beach, bridge, dock, pier, jetties, etc.)
- ○ Private boat fishing
- ○ Charter boat fishing
- ○ Head boat fishing
- ○ Kayak fishing
- ○ Other (Please specify) _____

Q4. Of the fishing experiences provided below, indicate how many saltwater fishing trips you take in a week, month, and year in Georgia. *Example, if you typically participate in shore fishing once a week, or three times in a month or perhaps 100 times in a year, then for shore fishing experience indicate 1 under Week, 3 under Month, and 100 under the Year column. Do the same for other fishing experiences that apply to you. Indicate 0 if not applicable.*

	Week	**Month**	**Year**
Shore fishing (shoreline/bank, beach, bridge, dock, pier, jetties, etc.)			
Private boat fishing			
Charter boat fishing			
Head boat fishing			
Kayak fishing			
Other (Please specify)			

In this section of the survey, we will collect information on the costs of participating in saltwater recreational fishing. For each item that applies to your saltwater fishing trip, please do your best to provide an accurate dollar amount that you spent. Indicate 0 for items that are not associated with your trip.

Q5. Considering your last saltwater fishing trip, how much money ($) did you spend on

Item	**Cost ($)**
Auto, truck, or RV fuel (*if you did not purchase fuel on your last saltwater fishing trip because you already had fuel, please estimate the cost of fuel used*)	
Auto, truck, or RV rental	
Boat fuel (*if you did not purchase boat fuel on your last saltwater fishing trip because you already had boat fuel, please estimate the cost of boat fuel used*)	
Boat rental (*if you rented the boat for a period (example, for a week) please estimate the cost of boat rental for your last saltwater fishing trip by dividing the total rental cost by 7 days*)	
Airplane ticket	
Train ticket	
Taxi service	
Bus ticket	
Lodging	
Campgrounds	
Restaurant meals	
Alcoholic beverages and soda	
Bottled water	
Ice	
Snacks	
Charter fishing fee	
Head boat fishing fee	
Fishing tournament fees	
Bait	
Tackle	
Gifts or souvenirs	
Other (Please specify)	

Respond to questions Q6-Q9 if you own and used a private boat for saltwater recreational fishing in the past 12 months.

Q6. How much money ($) do you pay monthly as boat insurance premium? _____

Q7. Which range below contains the approximate amount of money ($) you pay monthly for docking/boat storage? *Check one:*

- ○ $0
- ○ $200-$350
- ○ $351-$450
- ○ $451-$550
- ○ $551-$650
- ○ $651-$750
- ○ $751-$850
- ○ $851-$950
- ○ Over $950

Q8. Which range below contains the approximate amount of money ($) you pay annually for boat repairs and services? *Check one:*

- ○ $0-$99
- ○ $100-$499
- ○ $500-$999
- ○ $1000-$1,499
- ○ $1,500-$1,999
- ○ $2000-$2,499
- ○ $2,500-$2,999
- ○ $3,000-$3,499
- ○ Over $3,499

Q9. How much money ($) do you pay annually for boater registration fee? _____

Q10. What percentage of all the expenses you just described were spent in Georgia? _____

Q11. Was your last saltwater fishing trip part of a longer trip in which you spent at least one night away from your permanent or seasonal residence, or was it a one-day fishing trip?

- ○ Longer trip
- ○ One day trip

**** Respond to questions Q12, Q13, and Q14 if you selected "longer trip" in question Q11.***

Q12. How many nights were you away from your primary residence on this trip? _____

Q13. How many days of this trip did you go saltwater fishing? _____

Q14 What was the primary purpose of this entire trip away from home?

- ○ Saltwater fishing
- ○ Vacation or other personal trip
- ○ Business
- ○ Don't know

Q15. On average, how many miles roundtrip did you travel from your primary residence to the location of your last saltwater fishing trip? _____

Q16. What was the total duration (hours) of your last saltwater fishing trip? _____

****Respond to question 17 and 18 if you selected "private boat fishing" in question Q3.***

Q17. If your fishing experience was private boat fishing, what was the total distance (in miles) travelled in the boat, based on your last saltwater fishing trip? _____

Q18. How many gallons of boat fuel was used in your last saltwater fishing trip? _____

Saltwater fishing area and fishing boat departure location

Q19. Based on your last saltwater fishing trip, select the area of water in which you spent most of your time actively fishing.

- ○ Inshore (saltwater bays and estuaries)
- ○ Nearshore (from the shoreline to 12 nautical miles out)
- ○ Offshore (greater than 12 nautical miles from shoreline)

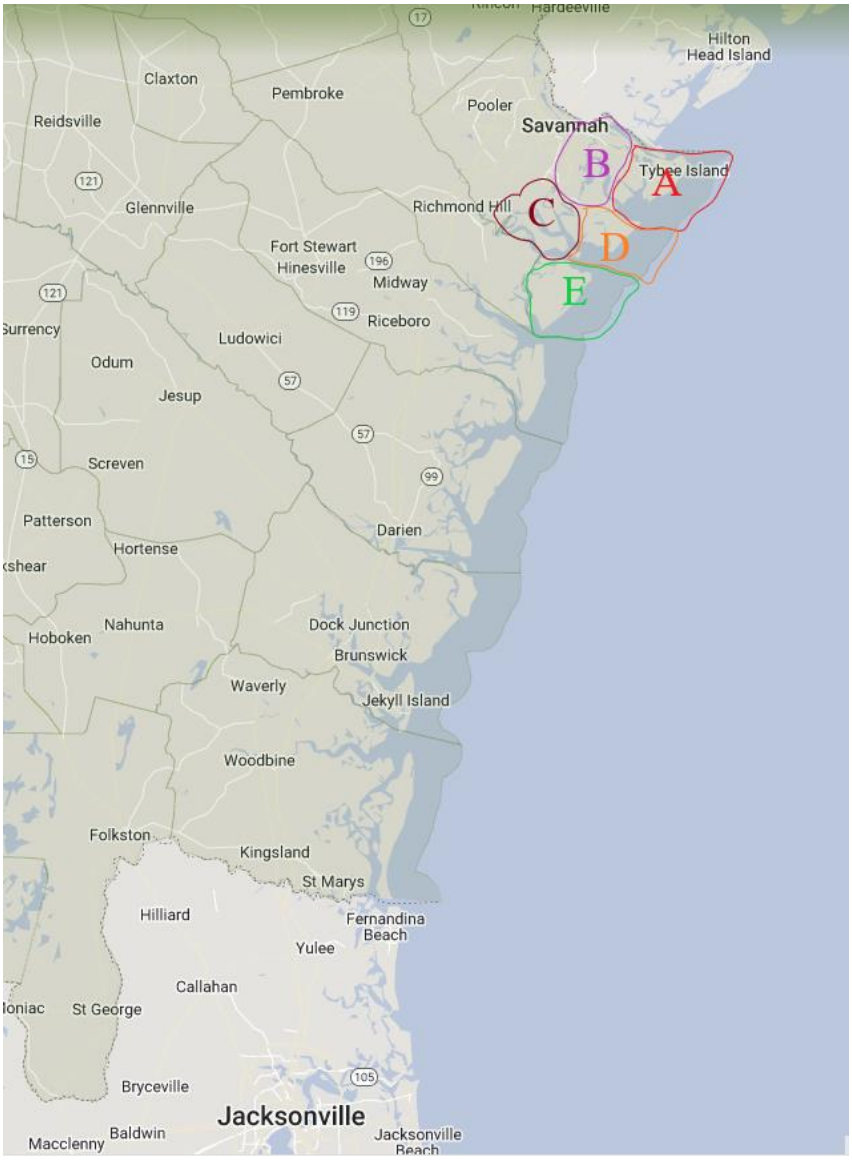
Q20. Based on your last saltwater fishing trip, from which Georgia coastal county did you spend most of your fishing time (shore fishing trip) or depart from in the boat (private, charter boat, and head boat fishing) to go fish? *Check one*.

- ○ Chatham County
- ○ Bryan County
- ○ Liberty County
- ○ McIntosh County
- ○ Glynn County
- ○ Camden County

Respond to question Q21a if you selected "Chatham County" or "Bryan County" in Q20.

Q21a. Based on the map provided, which of the following letters best represent the site you spent most of your fishing time (shore fishing trip) or departed from in a boat (private, charter boat, and head boat fishing) based on your last saltwater fishing trip? *Check one*.

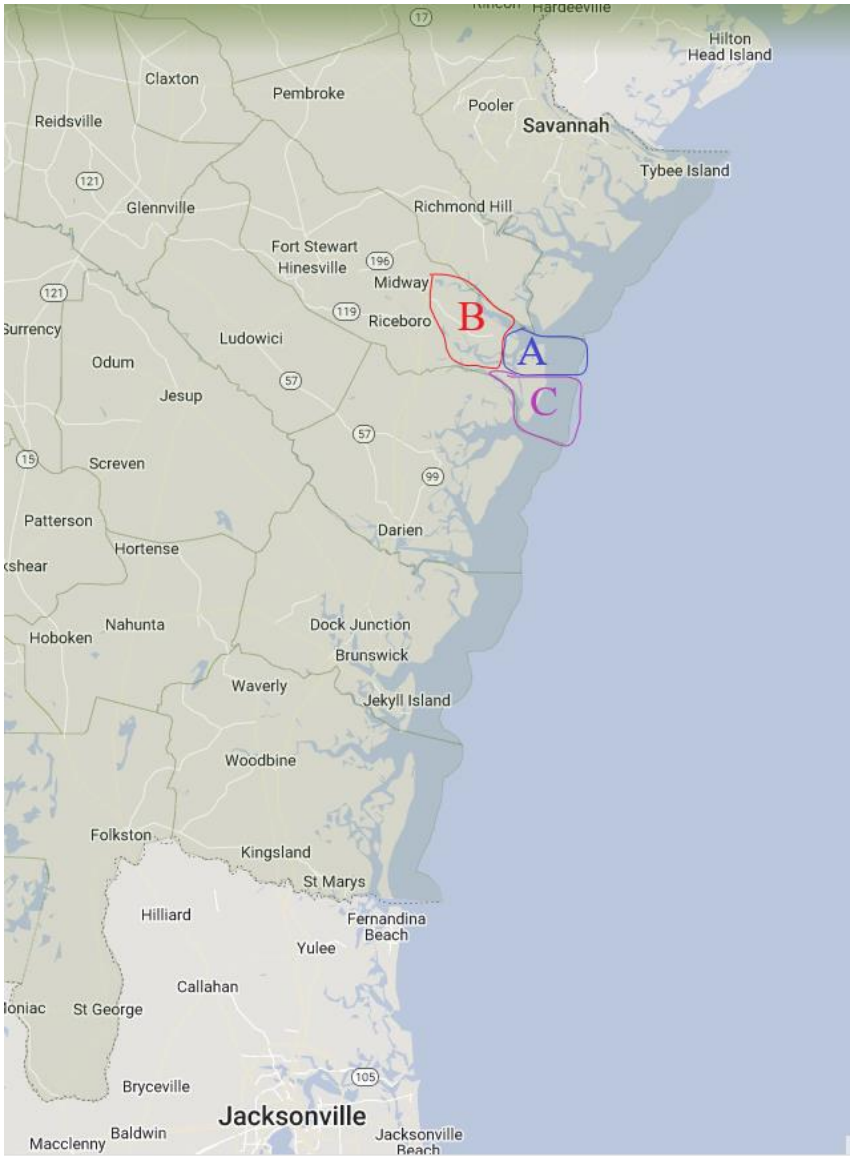
- ○ A
- ○ B
- ○ C
- ○ D
- ○ E



Respond to question Q21b if you selected "Liberty County" in Q20.

Q21b. Based on the map provided, which of the following letters best represent the site you spent most of your fishing time (shore fishing trip) or departed from in a boat (private, charter boat, and head boat fishing) based on your last saltwater fishing trip? *Check one*.

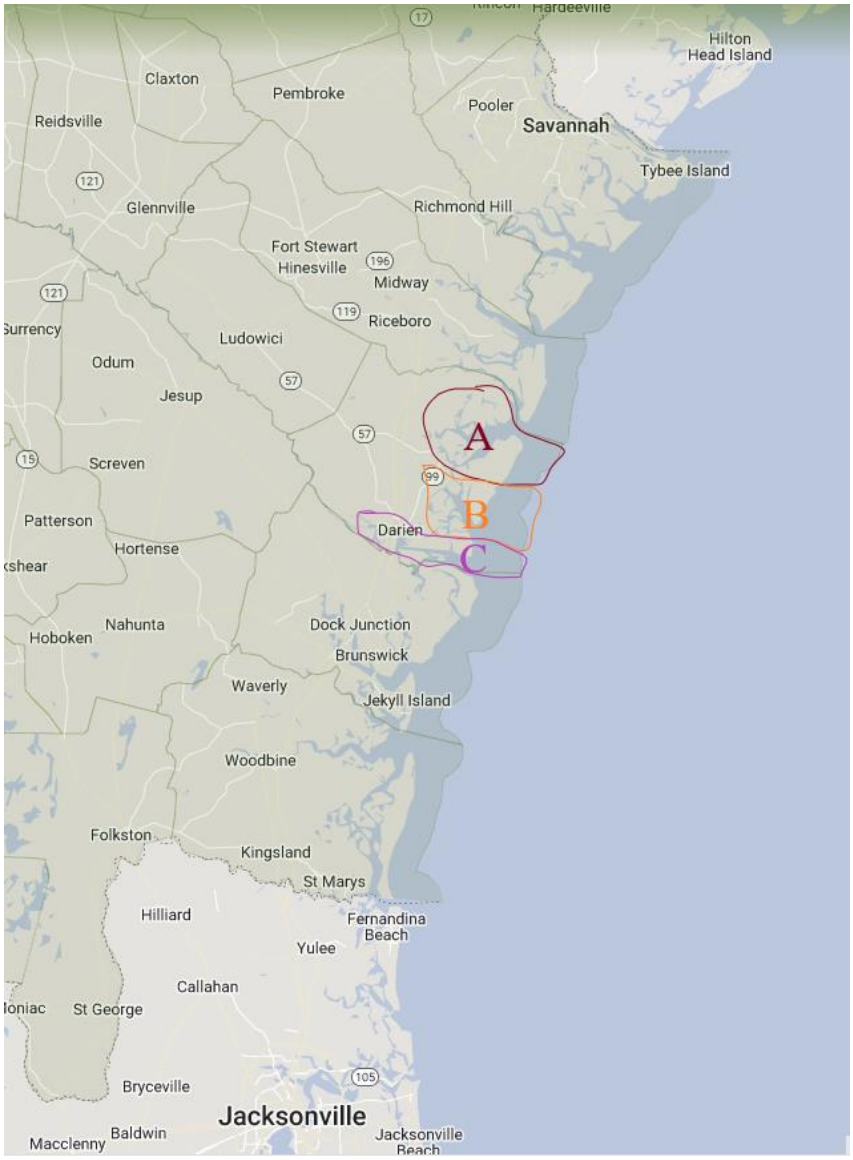
- ○ A
- ○ B
- ○ C



***Respond to question Q21c if you selected "McIntosh County" in Q20**.*

Q21c. Based on the map provided, which of the following letters best represent the site you spent most of your fishing time (shore fishing trip) or departed from in a boat (private, charter boat, and head boat fishing) based on your last saltwater fishing trip? *Check one*.

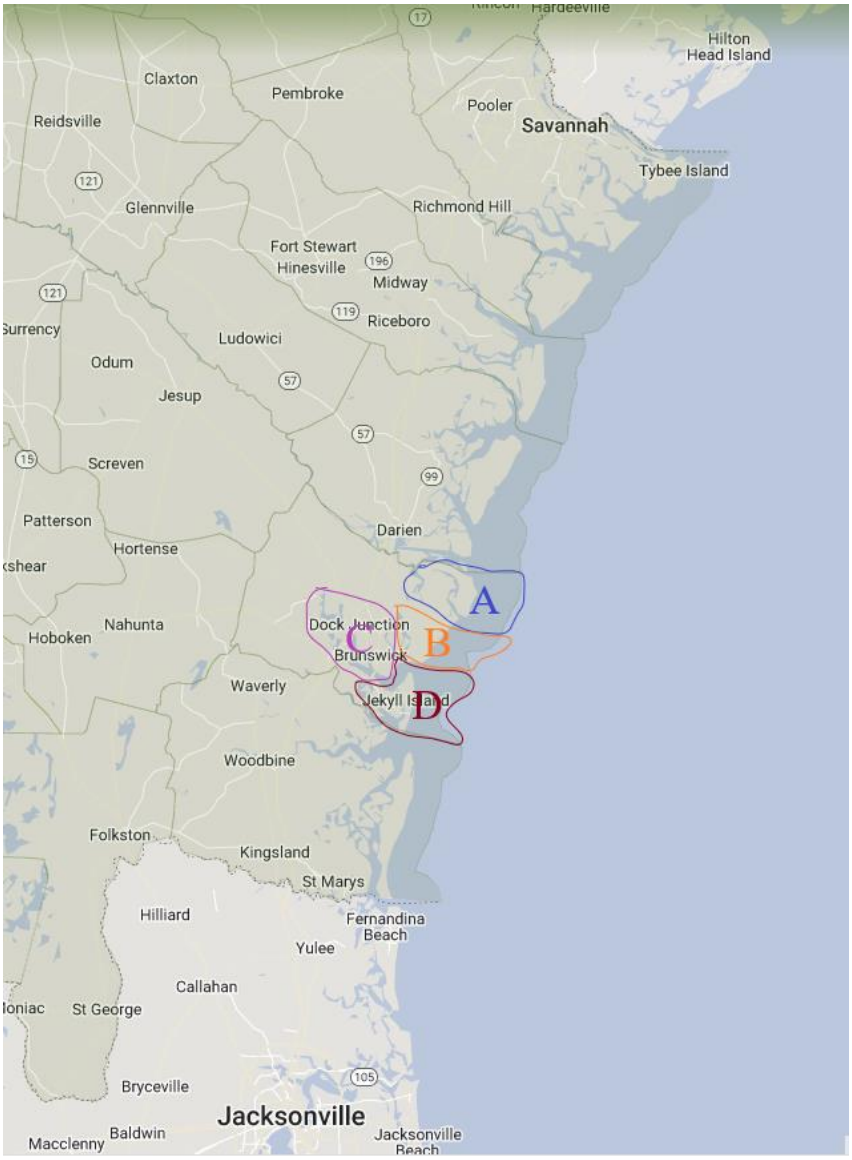
- ○ A
- ○ B
- ○ C



Respond to question Q21d if you selected "Glynn County" in Q20.

Q21d. Based on the map provided, which of the following letters best represent the site you spent most of your fishing time (shore fishing trip) or departed from in a boat (private, charter boat, and head boat fishing) based on your last saltwater fishing trip? *Check one*.

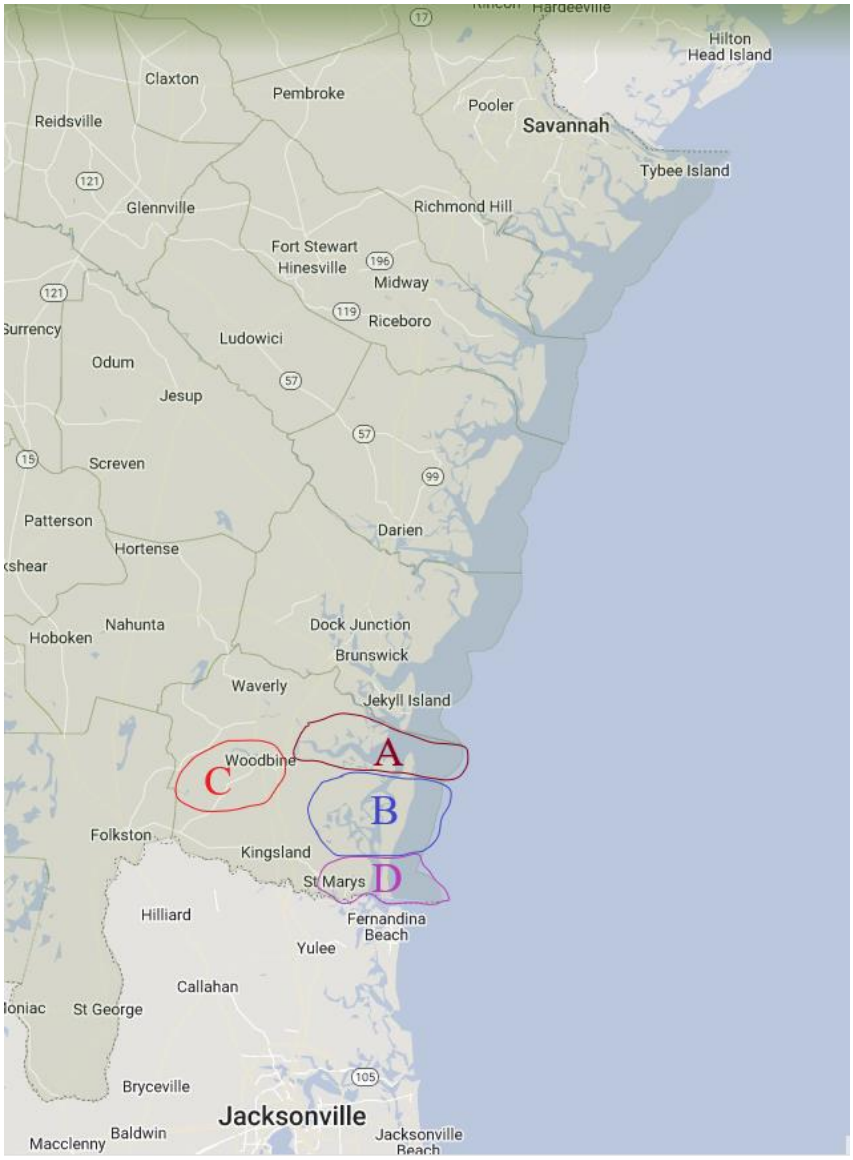
- ○ A
- ○ B
- ○ C
- ○ D



Respond to question Q21e if you selected "Camden County" in Q20.

Q21e. Based on the map provided, which of the following letters best represent the site you spent most of your fishing time (shore fishing trip) or departed from in a boat (private, charter boat, and head boat fishing) based on your last saltwater fishing trip? *Check one*.

- ○ A
- ○ B
- ○ C
- ○ D



Q22. How many saltwater fishing trips do you typically take in a week, month, and year to the location of your last saltwater fishing trip?

	Number of saltwater fishing trips
Week	
Month	
Year	

Q23. For your next saltwater fishing trip, from which Georgia coastal county do you plan to spend most of your fishing time (shore fishing trip) or depart from in a boat (private, charter boat, and head boat fishing) to go fish? *Check one*.

- ○ Chatham County
- ○ Bryan County
- ○ Liberty County
- ○ McIntosh County
- ○ Glynn County
- ○ Camden County

Targeted species

Q24. What fish species do you typically target? *Check all items that apply*.

- ○ Spotted Seatrout
- ○ Red Drum
- ○ Whiting
- ○ Flounder
- ○ Red Snapper
- ○ Shark
- ○ Sheepshead
- ○ Tarpon
- ○ Atlantic Croaker
- ○ Black Sea Bass
- ○ Black Drum
- ○ Other (please specify) _____

Q25. Of the fish species you typically target, how many do you need to catch (released and harvested) to feel like it was a successful fishing trip? **Based on the fish species selected in Q24.*

Fish species	**Number to catch to feel like a successful fishing trip**
Spotted Seatrout	
Red Drum	
Whiting	
Flounder	
Red Snapper	
Shark	
Sheepshead	
Tarpon	
Atlantic Croaker	
Black Sea Bass	
Black Drum	
Other (Please specify)	

Factors affecting choice of fishing site

Q26. What do you consider when choosing your saltwater fishing site? Rank each factor listed below from 1 through 10. 1 is the most important. For example, if you consider *water quality* to be most important and *number of people on site* to be least important when selecting saltwater fishing site, then assign 1 to *water quality* and 10 to *number of people on site. *For internet version: to rank the factors, click and hold a factor, then drag up or down to rearrange to your preferred position.*

Factors	Rank
Distance from my residence to fishing site	
Availability and quality of boat ramps, piers, or jetties	
Weather (wind, humidity, temperature, water temperature, degrees of sunshine, etc.)	
Number of people on site (crowding)	
Availability of parking space, restrooms, tap water, etc.	
Proximity to natural or artificial reef	
Proximity to bait, ice, tackle store, restaurant, gas station	
Water quality	
Past successful fishing at the site	
Good fishing report about the site (heard the bite is good)	

Q27. Which of the following is your best source for Georgia saltwater recreational fishing information? *Check one*.

- ○ Internet
- ○ Tackle shop
- ○ Marina
- ○ Friends and family
- ○ Other (Please specify) _____

Q28. The designers of this survey appreciate the time and effort you devote to completing our survey. It is important to differentiate between respondents who speed through surveys without properly reading the questions and other respondents who are thoughtful and engaged

accordingly. To demonstrate that you have read this question carefully, please select the flounder option below.

Which fish species did you catch on your last trip? *Check one:*

- ○ Seatrout
- ○ Red fish
- ○ Sheepshead
- ○ Tarpon
- ○ Flounder
- ○ Red snapper

Demographic information

This is the last and equally important section of the survey. In this section we seek to understand the socio-demographic profile of anglers. The information you provide will be combined with those from other anglers. No personally identifiable information will be collected.

Q29. Which state do you consider to be your primary residence? *Check one*:

- ○ Georgia
- ○ Other (Please specify) _____

Q30. What is your residential zip code? _____

Q31. What is your age (years)? _____

Q32. What is your sex? *Check one:*

- ○ Male
- ○ Female

Q33. Which best describes your race? *Check one:*

- ○ American Indian or Alaskan Native
- ○ Native Hawaiian and Other Pacific Islander
- ○ Asian

- ○ Black or African American
- ○ Hispanic
- ○ White or Caucasian
- ○ Other (Please specify) _____

Q34. What is your marital status? *Check one:*

- ○ Married
- ○ Widowed
- ○ Divorced
- ○ Separated
- ○ Never married

Q35. Which of these describe your household? *Check one:*

- ○ Family household
- ○ Nonfamily household

Q36. What is the highest education you have completed? *Check one:*

- ○ Did not complete high school
- ○ High school diploma
- ○ Associate's/ two-year degree
- ○ Bachelor's/four-year degree
- ○ Master's degree
- ○ Professional degree
- ○ PhD/Doctorate degree

Q37. Which Category best describes your annual household income? *Check one:*

- ○ Less than $20,000
- ○ $20,000-$39,999
- ○ $40,000-$59,999
- ○ $60,000-$79,999
- ○ $80,000-$99,999
- ○ $100,000-$124,999
- ○ $125,000-$149,999
- ○ $150,000 or more

We thank you for your time spent taking this survey


Back River 2020-2021


Bird Island 2023


Jointer Creek Monitoring 2024


Skidaway River 2021


South Channel Savannah River 2023


Back River Monitoring 2023


Blythe Island 2021


North Newport River 2023


Skidaway River Monitoring 2024


Jointer Creek 2021


North Newport River 2023


Troupe Creek 2020


Bear River 2020

Van Dyke Creek 2020


Van Dyke Creek 2020


Henry Vassa Cate 2020


Stafford Island 2022


Romerly Marsh Creek 2022


Ogeechee River 2022


Bear River 2023


Timmons River 2023


DRH 2018


CCA-JL 2020


DUA 2021


ALT 2021


L 2023


BSF 2018


JY 2020


KC 2021


F 2022


KC 2018


KTK 2021


CAT 2021


A 2022


CDH 2024


SFC 2020

F 2021


F 2022


KBY 2023


SFC 2024

BSF 2020


DRH 2021


CDH 2022

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

Marine Sportfish Population Health Survey

Ryan Harrell

Finfish Advisory Panel

February 28, 2024

Mission Statement:

To balance coastal development and protection of the coast's natural assets, socio-cultural heritage and recreational resources for the benefit of present and future generations.

Marine Sportfish Population Health Survey (MSPHS)

- Used to collect information on the biology and population dynamics of recreationally important estuarine finfish

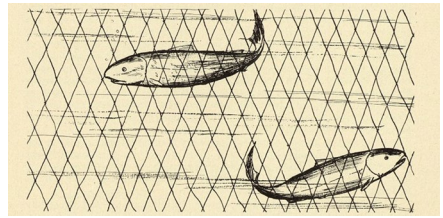
- Began in 2003 – Re-analyzed in 2009

- Sampling ongoing in three Georgia estuaries:
  - Altamaha – 2003
  - Wassaw – 2003
  - St. Andrew – 2019
    - Finalize St. Andrew sites this offseason

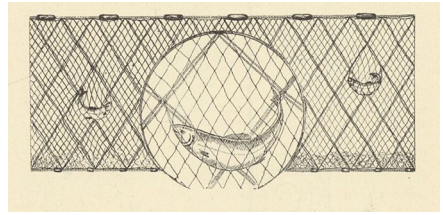
- All catch is identified, counted, measured in fork length (mm), and released

Fishery Independent – MSPHS Netting Surveys

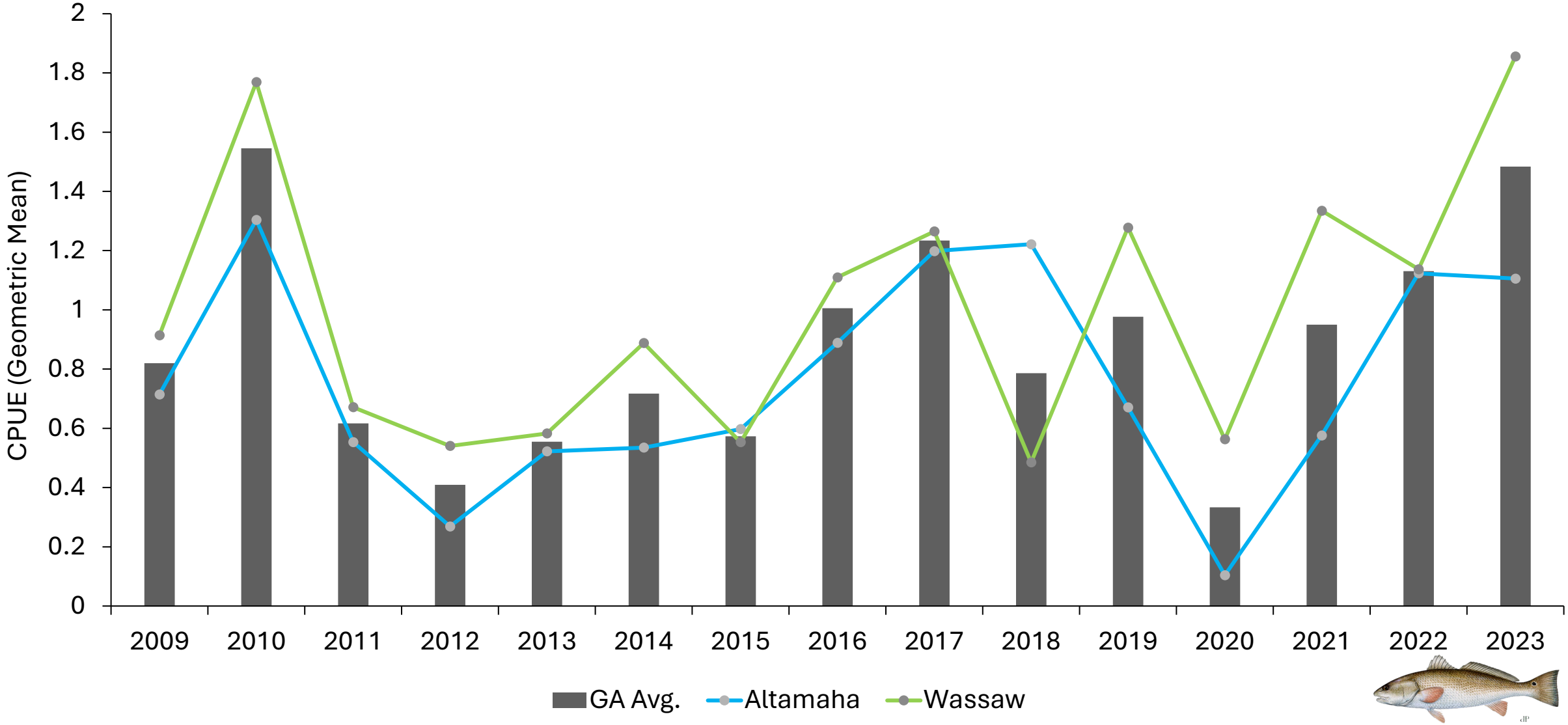
- **Gillnet Survey**
  - June through August
  - 300 ft x 9 ft with 2.5 in stretched mesh
  - 36 sets monthly in each sound system
  - Targets young-of-the-year Red Drum
  - Information collected on other finfish species is still useful when considering relative abundance, seasonal trends, and location of occurrence



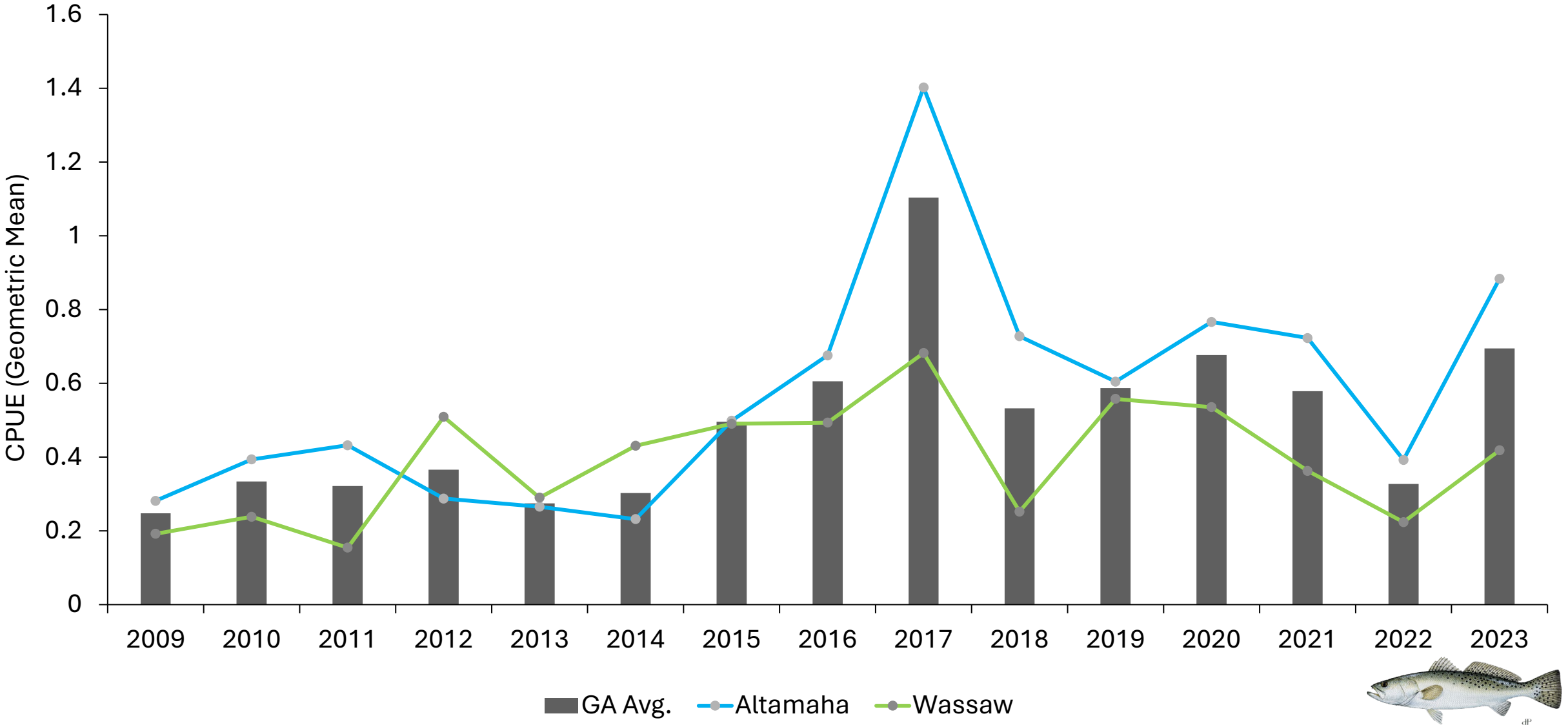
- **Trammel Net Survey**
  - September through November
  - 300 ft x 7ft with 14 in stretched outer panels and 2.75 stretched inner mesh
  - 25 sets monthly in each sound system
  - Targets multiple species (Spotted Seatrout primary target)



Gillnet Survey Results – Red Drum



Trammel Net Survey Results – Spotted Seatrout



GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

Georgia Saltwater Fishing Satisfaction Survey

Kathy Knowlton

Finfish Advisory Panel

February 28, 2024

Mission Statement:

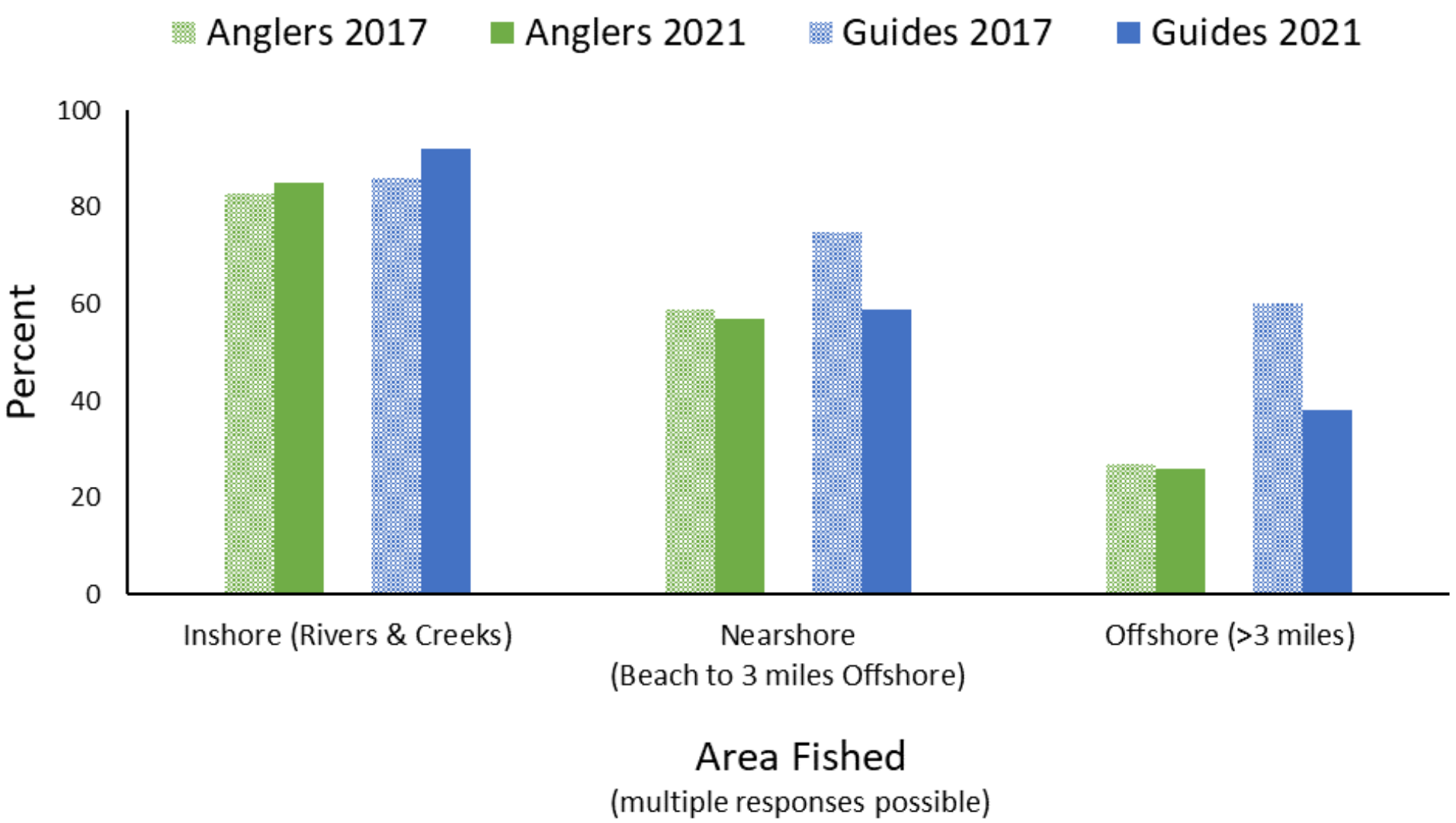
To balance coastal development and protection of the coast's natural assets, socio-cultural heritage and recreational resources for the benefit of present and future generations.

2021 Angler & Guide Saltwater Satisfaction Survey

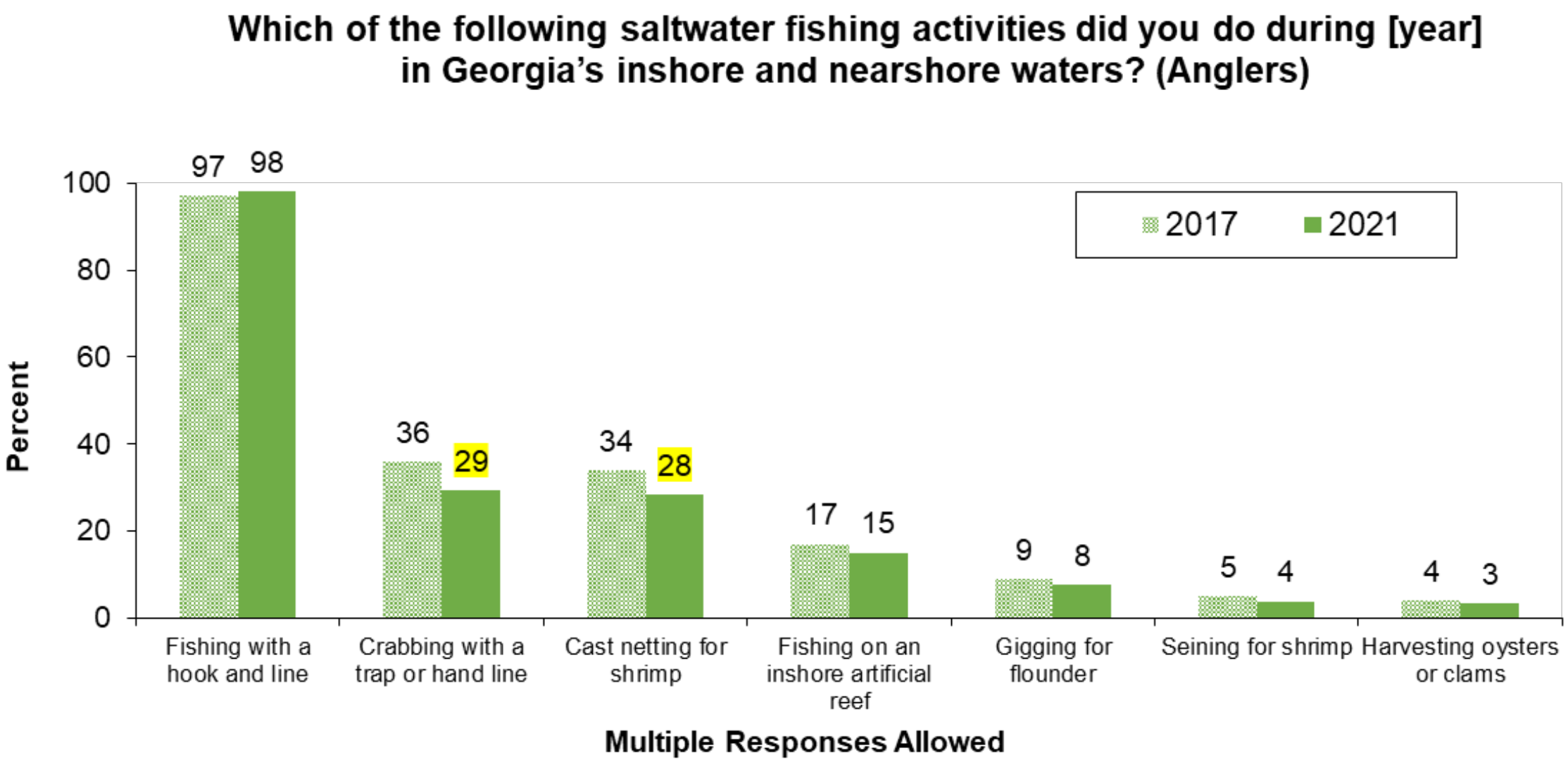
- Survey Conducted by Responsive Management
- **ANGLERS**
  - Anglers randomly selected from 230,000 Georgia resident SIP permit holders
  - Invited to participate if fished in Georgia saltwaters during 2021
  - Telephone and/or online survey
  - 2,026 completed interviews
    - 144 Georgia counties (90%)
    - 11 coastal counties = 45% of interviews
  - Data cross-tabulated
    - coastal vs noncoastal
    - Avid > 10 days vs less avid ≤ 10 days

- **GUIDES**
  - All 194 licensed Georgia resident saltwater guides invited to participate
  - 55% (n = 107completed interviews

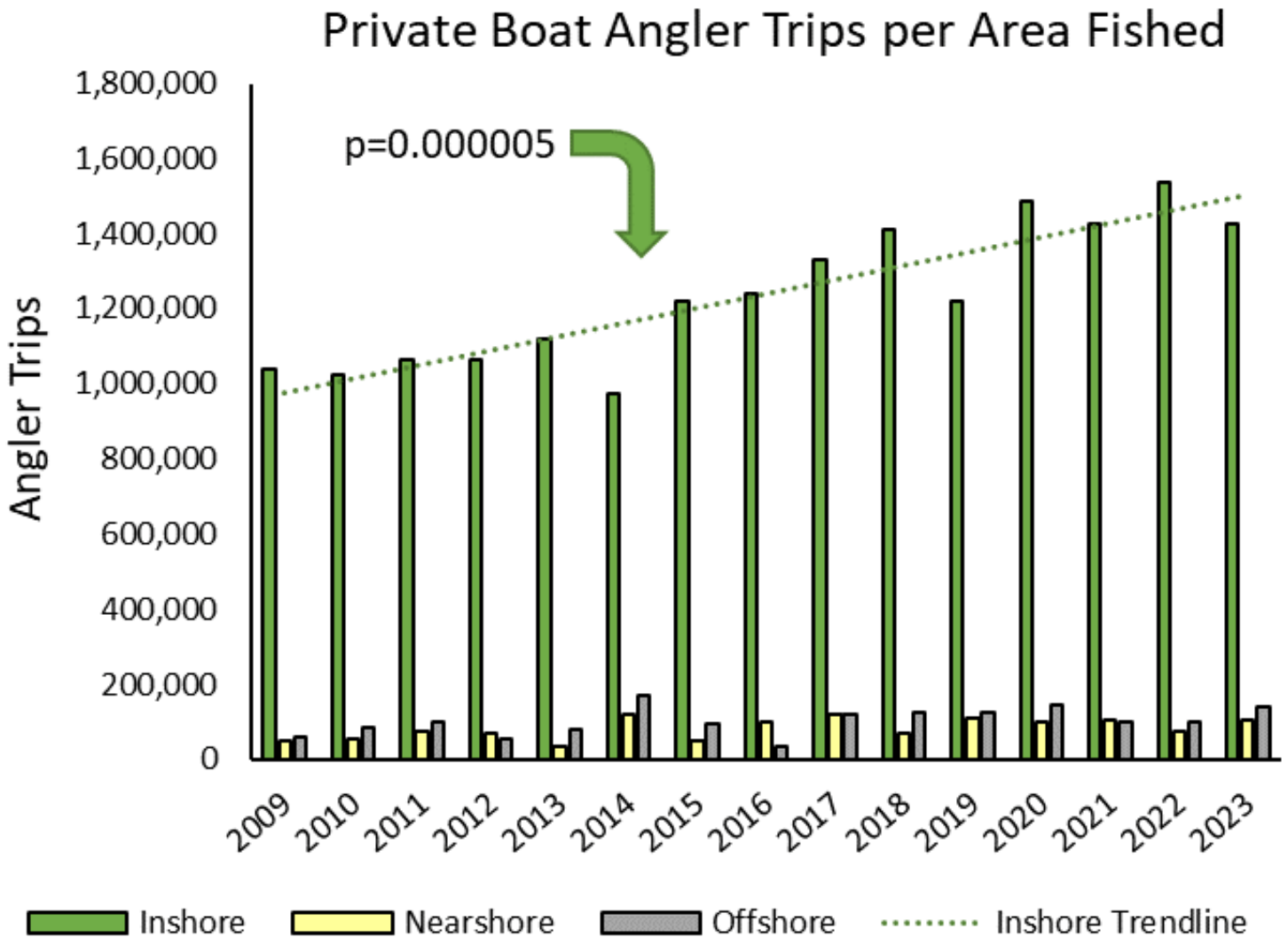
Area Fished


Anglers 2017
Anglers 2021
Guides 2017
Guides 2021
Percent
100
80
60
40
20
0
Inshore (Rivers & Creeks)
Nearshore
(Beach to 3 miles Offshore)
Offshore (>3 miles)
Area Fished
(multiple responses possible)

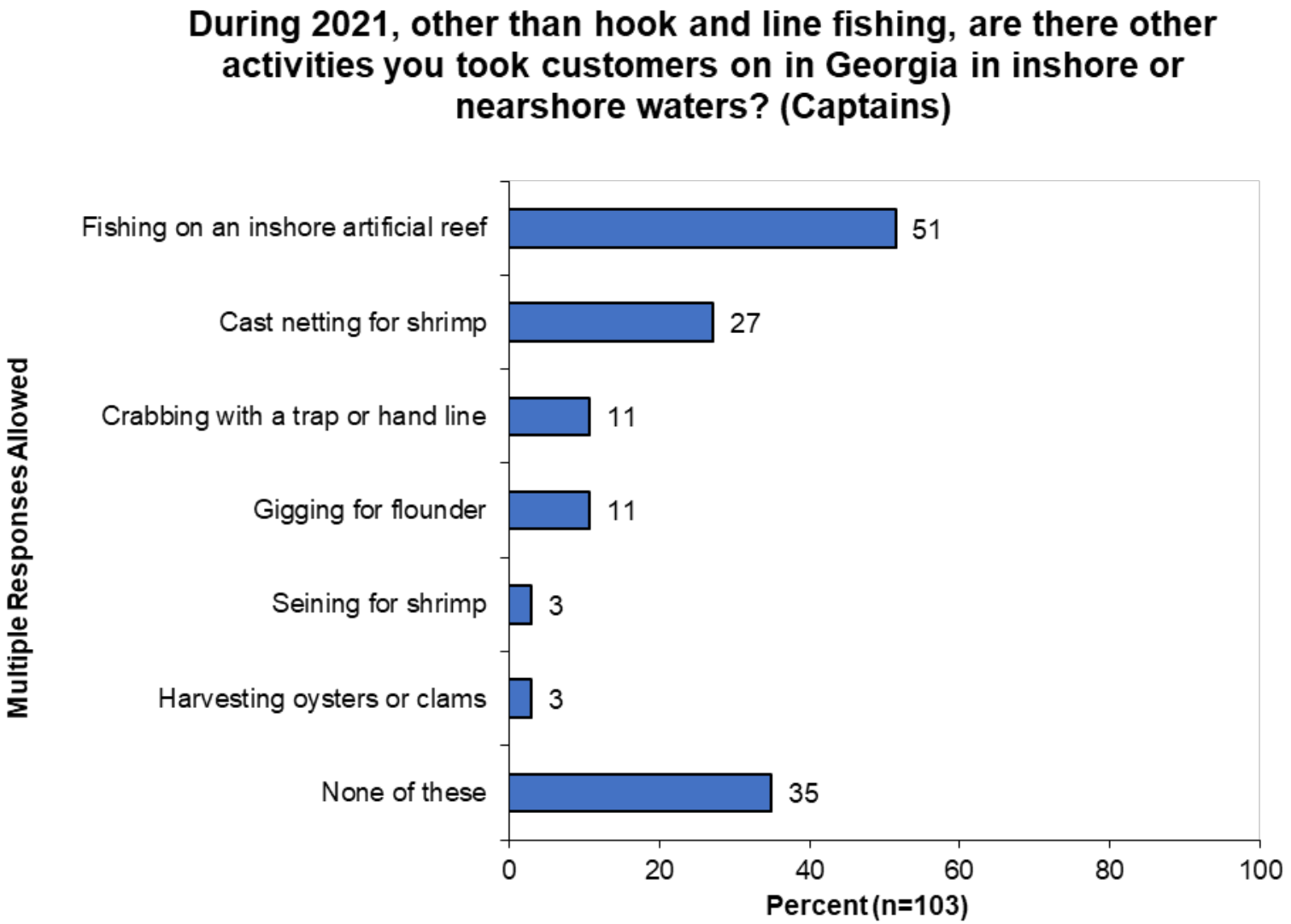
Saltwater Fishing Activities



Angler Saltwater Fishing Effort in Georgia



Charter Saltwater Fishing Effort in Georgia



Saltwater Fishing Effort by Target Species

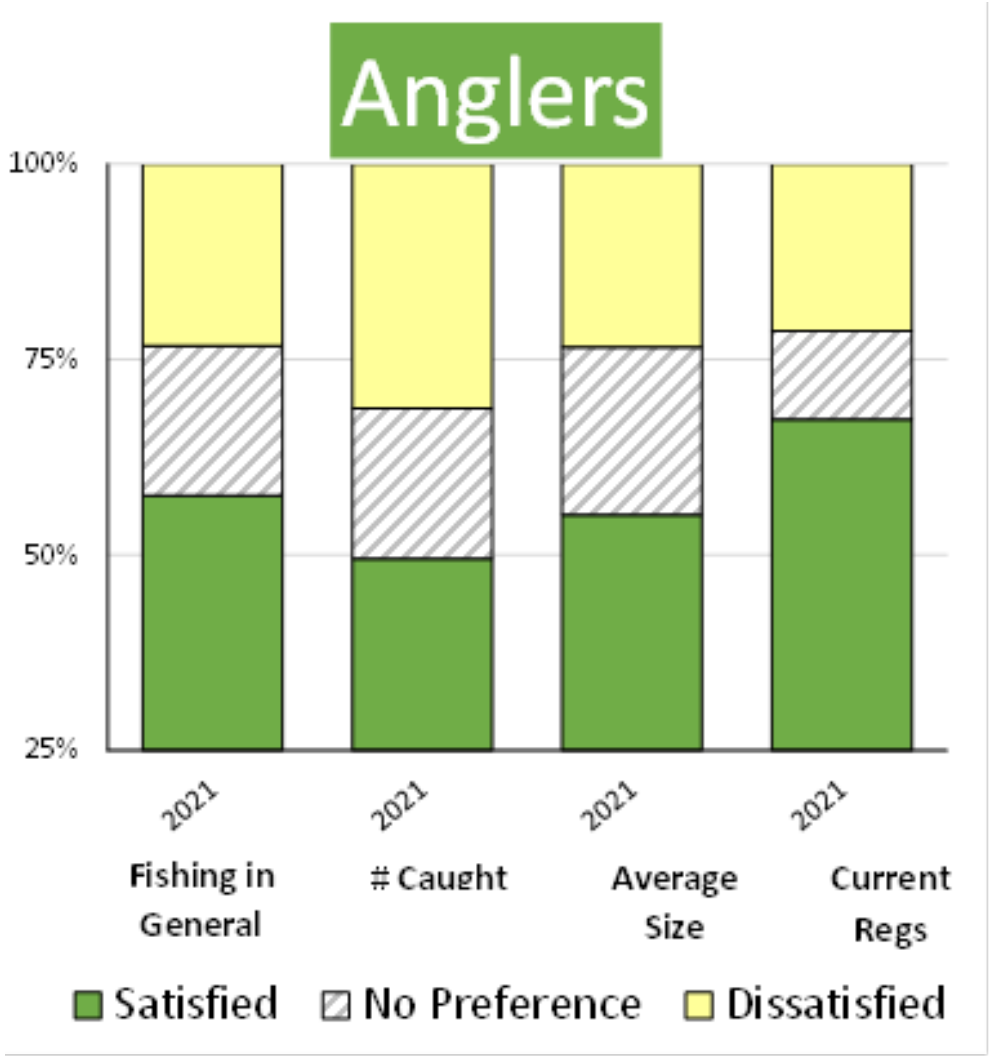
	Anglers		Guides	
	2017	2021	2017	2021
Do you typically fish for RED DRUM?	54%	52%	80%	89%
How many DAYS did you fish for RED DRUM in last 12 months?	18	22	64	78

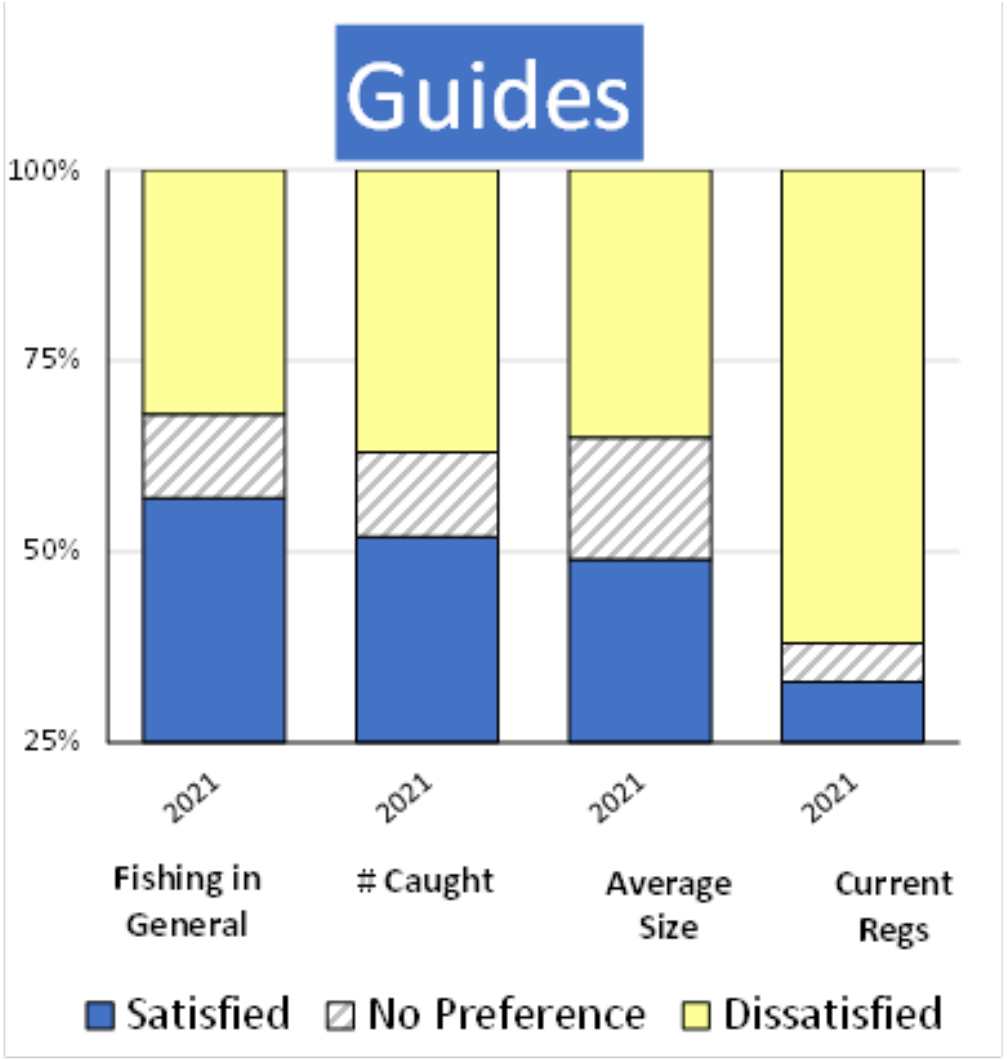
	Anglers	Guides
	2021	2021
Do you typically fish for FLOUNDER?	40%	59%
How many DAYS did you fish for FLOUNDER in last 12 months?	19	62

	Anglers		Guides	
	2017	2021	2017	2021
Do you typically fish for SPOTTED SEATROUT?	49%	59%	78%	83%
How many DAYS did you fish for SPOTTED SEATROUT in last 12 months?	19	22	76	82

	Anglers	Guides
	2021	2021
Do you typically fish for SHEEPSHEAD?	31%	45%
How many DAYS did you fish for SHEEPSHEAD in last 12 months?	15	36

Flounder





Satisfaction question included stating current regulations were 15 fish per person per day with a 12-inch total length minimum size limit, and year-round harvest.

Flounder

When fishing for flounder, did respondents use H&L, Gig or Both?

	Gig Only	H&L Total
Anglers	4%	96% (78% + 18%)
Captains	2%	98% (90% + 8%)

(Where H&L Total = “H&L only” added to “use both methods”)

Of those that fish with both, what percent of time do those respondents fish for flounder with H&L vs gig?

Mean H&L = 91% Gig = 9%

Questions?